UNDERSTANDING TECHNICAL ENGLISH

R. Sudarsanam

Understanding Technical English aims to provide the knowledge required to develop skills in reading science texts, articles in journals and reports, in interpreting them and in acquiring the ability of scientific argumentation necessary for further learning, inter-personal communication and research. The book is designed in the form of learning-centred activity-based modules, and organized in such a way that the learners can progress *from module to module, according their competence, (a) to adopt a* suitable reading strategy, (b) to use language appropriately in relation to the needs of a given discourse, (c) to interpret textual and non-verbal forms of representative discourse structures in science, (d) use/edit words in relation to grammatical, contextual and communicational needs, and (e) to participate in the social contexts of inter-personal communication.

The book is the result of class-room research spread over five years at the Tamil Nadu Agricultural University, Coimbatore, and has been acclaimed by both students and teachers who have been using it.

Rs. 90/-

Understanding Technical English

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FOREWORD

English is the language of modern Science and Technology, International Communication and Learning-teaching of higher professional education in our country. In these circumstances, no professional student is likely to fare well or progress or contribute if the person is not equipped with skills of reading technical articles and text-books, of participating in seminars and symposia and internalising appropriate forms of technical discourse communication. Hence it is incumbent on the students of higher professional education that they acquire these skills and competencies. It is to serve these important purposes that the Tamil Nadu Agricultural University started the Department of Languages (Communication) and supported teaching and research in Technical English, Applied Linguistics for Communication and Educational Technology. The Department has been fulfilling these 'expectations' as could be seen from its publications and this book.

The present book attempts to teach skills and strategies of reading and communication through problem-posing/solving tasks and to make the process of 'learning' interesting, effective, methodical and self-sustaining. In these days when teaching of 'communication skills' is emphasized, this book provides a pioneering model in organising learning-teaching of language skills in the form of educationally viable 'self-learning modules'. I compliment Prof. Sudarsanam, the author, for the work he has done in this area, and for bringing out this book--a model which teachers and students of English in Technical Institutions may profitably adopt or adapt.

V. Rajagopalan
Vice-Chancellor
Tamilnadu Agricultural University

PREFACE

1.0 Objectives of the Book

This book has been designed to help the students of Science in colleges and universities learn to

- identify and adopt different strategies of reading suited to one's needs (session 'A'),
- Comprehend and interpret textual communication
- use language according to needs of discourse logic (:scientific argumentation) (session 'B'),
- interpret representative technical discourse structures (session 'C')
- convert textual notes to appropriate non-verbal forms of communication in science, and vice versa, (session 'C'),
- internalize the communicational use of language features for purposes of reading with expectations, and of editing purpose- fully for popular communication (session 'D'),
- understand general forms of inter-personal communication and improve listening comprehension skills (session 'E'), and
- cultivate key scientific values as are required for professional development (themes of texts in session 'A')

2.0 Organization

The materials have been selected and organized such that every 'self-learner' and teacher of Engligh could use them with confidence and achieve the objectives.

There are ten modules, each with five sub-modules (:sessions) and each session programmed to achieve a given learning objective in one hour of classwork and one hour of homework. Students who have done them systematically have recorded phenomenal improvement in their competencies.

Each session is organized in the form of systematic procedures for 'self-learning' and improving certain specific skills; the main focus is on meaningful activities and problem-solving. Further, as communicative skills operate integratively, an attempt for integrated learning (: reinforcing networks) of the skills has been made by building horizontal integration between 'sessions' within a module (in terms of discourse structures) and vertical integration between modules (in terms of re-cycling the 'text' materials and skills already learnt). The sub-skills identified for each session and their integration are presented in the Table appended. Except for the first 10 minutes, when the teacher is required to give a 'pep' talk on an interesting issue in order to motivate, and induce acquisition of better IL, the classroom activity is expected to be one of 'doing and learning', and not be marked with any kind of lecture (:no lecture method).

The variety of tasks set up in each session, and the type of skills required to be put to use for doing the tasks help to sustain the motivation of the learners in 'doing and learning' and 'doing for learning'. A model for evaluation procedure is also appended; it may be adapted/adopted by the teachers according to their situational needs. A copy of the examination paper of I year students of B.E. of Bharatiyar University is also appended for reference. (appendix III)

3.0 Design for Learning-Teaching

SESSION A: *Reading Strategies and Reading Comprehension*

The focus is on training the learners in different kinds of reading skills using interesting general texts. The learner is expected to proceed systematically as per the procedure set out for learning each skill. The tasks are so set as to help the learners learn the procedure for reading purposefully, and consequently, improve their rate of reading comprehension. Exercises under A3 (dealing with cohesion and coherence) help to develop intensive reading comprehension, and exercises given under A4 provide scope for free writing. The themes of the texts selected for reading are such as to help the learners imbibe certain important scientific values (vide A1). As the tasks are programmed, the learners are required to move forward step by step, and not jump the steps.

SESSION B: *Discourse Logic and Coherent Thinking*

A series of short texts have been set to lead the learners progressively from meaningful use of words at a point (B1) to the use of syntactic and semantic expressions and finally to meaningful use of statements in relation to given forms of discourse logic or argumentation (B4-6). As the text materials are re-cycled from the 'passages' taught in session 'A' of earlier modules (and as the students will then 'know' the theme/idea of the 'texts') they would subconsciously learn appropriate communicational use of language by doing these exercises. As the learners would incidentally recognise that several forms of statements could be used to serve a given discourse function, they would keep moving from one level of inter-language to a higher improved level. As the exercises -- predominantly in the form of completion exercises, would require the learners to match the discourse connectors and the features of cohesion and coherence in relation to given 'theme'/situation, the learners would imbibe the skills of thinking in the language. The words set for tasks given under B1 have been selected from a list of errors-in-use committed by agricultural scientists compiled by us from an analysis of their articles and theses.

SESSION C: *Technical Discourse and Interpretation*

Each sub-module is built around one representative (authentic) science discourse form and related non-verbal forms of communication. As reading a science text calls for more close reading and convergent form of interpretation, attempt has been made to instil in the learners a systematic procedure for tackling science texts. Hence, the exercises have been designed to help the learners 'interpret' technical discourses, learn to use non-verbal and verbal forms of technical communication appropriately and to internalise the special uses of language features in technical communication. Incidentally the learners learn different forms of note-taking and note-making generally useful for taking down notes from class lectures/from library books.

SESSION D: *Integrated Grammar and Editing Extension Comunication*

In order to teach communicative grammar integratively 'cloze' texts (passages with systematic blanks) have been set up. As these texts are modified versions of the 'passages' learnt already in session 'A' of the same module, the learners would subconsciously experiment with the use of language items, and learn to use words sensitively in terms of a) grammaticality, b) contextual relevance and c) communicative appropriateness. Regular exercises of this kind have shown that all the learners, whether they are disadvantaged or good in language competencies, a) move forward towards improved Inter-language, b) learn to edit written materials purposefully and c) learn to read with 'expectancies'. Cloze texts from module six to ten attempt also to familiarise the learners to specific forms of extension communication like the leaflet and bulletin, and in a way, exemplify the methods of expanding short 'abstracts'into long passages. As different kinds of clues are built into the exercises, the cloze texts have proved to be an interesting educational tool which could incidentally promote acquisition of skills of purposeful writing.

SESSION E: Listening Comprehension and Inter-Personal Communication

The themes and discourse structures introduced in the earlier sessions of the module are used to develop 'dialogues'; the exercises are meant to generate 'interaction' among students and lead to natural spot 'dialogues'. The main aim is to familiarise the learners to conventional forms and strategies which are in common use in our colleges and universities. In this sessional work, the learners are carried forward from participation in 'dialogue'situations to listening to monologues, and then to 'role playing' situations. It provides scope for the use of recorded cassettes, and for 'proficient' students to role play and create the learning climate.

4.0 The Role of the Teacher

The role of the teacher in this learning-centred approach is to promote a systems approach among the learners to learn on their own and to facilitate internalization of the procedure. Some tasks are meant to promote 'fluency' (vide B3-5) and some 'accuracy' (vide B1 & D). However, the tasks are so organized that with a few learning promotion strategies like prompting, focusing on the clues, illustrating and seeking/providing contextual clarification, the teachers could promote even flow of learning on the part of the learners. For instance, the tasks set up for session 'A' require the learners to recall known (:prior) knowledge, identify words which may fall under one schema or concept; the tasks in 'B' deal with words which seem to cause problem-in-use to students of science. The tasks in general are so formed that even a 'disadvantaged' language learner could complete them with expressions available already in the given text. As the texts used in 'B' are adaptations of self-contained thought units from the passages done earlier under A2/A3, the learners' focus would be on 'reasoning'with language, and hence learn the thinking skill also.

5.0 Systematizing Learning -- Teaching

The teacher is required (i) to motivate the learners with a 'pep' talk on the importance of learning the particular skills of the session in association with any interesting topic/'news' of the 'day'. Then two or three good students may be asked to read aloud the instructions to exercises. The learners incidentally learn proper pronunciation and accentuation and also to read meaningfully. (ii) Then set the learners to do the tasks by following the given procedure moving from task to task in the given order. (iii) Then have one or two students read aloud pertinent areas, and help the learners interpret the text in relation to the needs of the given task.

SESSIONS A & B

As soon as each task is done, encourage students to learn from their peers. The students with 'initial' handicap may be grouped with a learner with 'initial' advantage and have the tasks done as group activity. The tasks for session 'B'are also to be done in the given order as these have been programmed to lead them from 'guided'/'cued' tasks to free tasks. Though the focus is on 'meaning' it appears necessary to help the learners recognise the importance of use of certain words and structures in developing argumentative discourse. Hence in certain tasks cues are deliberately given.

SESSION C

The general procedure for 'reading' developed in session 'A' may be followed here also, but with a greater focus on 'intensive' and close reading strategies. It will be noticed that each session is started with a task/problem and 'reading'/listening/writing activity is set up in order to solve the given problem task. When model reading of the 'discourse' (in session 'C') is given by one or two students, help the learners: (i) relate each statement with the 'given' problem/task and the non-verbal supports, and (ii) interpret the 'contextual' meaning (:value) of words and structures accordingly. Tasks for writing (C5/6) have been set as part of recognising and understanding technical discourses, and not as tasks in their own right as the aim of the course has been mainly concerned with reading strategies and comprehension.

SESSION D

The tasks have been centred around 'cloze' text procedure. The cloze texts (with systematic blanks) are adaptations of the reading passages given in session 'A'; hence the teacher may shoot a series of oral questions on the text and have the learners answer them orally. After this process has been gone through, the learners may be asked to fill in the first 15 blanks in a given time of 15 minutes. Then call for the answers for each blank and write them in a classified order and discuss the acceptability of each answer in three ways: (a) first, in terms of grammatical acceptability, (b) then of contextual relevance and (c) finally of communicative appropriateness. Then the students may be grouped, each group required to complete the cloze text in the last 10 minutes. Our experience has been that the students take a long time with the first four cloze texts, and subsequently learn to do the texts fast and correctly also. Tasks set from module '6' involve expansion of key themes into communication forms, generally used for extension education purposes. The learners' attention may incidentally be drawn to the structural units of the given communication forms.

SESSION E

Pairs of students may be asked to play the roles marked in the given dialogue. First have 'two good' students to read aloud the dialogue and have the rest listen to the dialogue (keeping the books closed) and to answer the 'given' questions. Thus, the set dialogues are to be used primarily as 'listening tasks' and then incidentally to be used as models for inter-communication. Let two or three pairs of students repeat this exercise; then the teacher may write the theme of the dialogue on the blackboard and then the discourse markers and courteous terms used in the dialogue. Then the teacher may invite pairs of students and set them to talk with each other as to who should play what 'role' in the dialogue, and then have them build the dialogue (without reference to the one given in the book). This procedure may be adapted to suit the needs of tasks given from module 6.

6.0 Our Try-outs

These materials have been tried out since 1983 and properly refined. It takes about 50 hours of classwork and about 50 hours of homework, and thus is suitable for one semester/trimester of teaching in technical institutions. The texts (session 'A') selected for imparting reading skills exemplify the use of general English by scientists, and those selected for session 'C' belong to representative science discourse forms. More examples from 'Biology' have been given as we felt that both the teachers and the students could handle them easily and also because the learners would be interested in themes which are palpably different from what they may be reading in their main fields of study. However, these are representative discourse forms and as such would serve the needs of helping them learn technical discourse structures. The materials have been prepared integrating the recent advances made in ELT, Applied Linguistics, Communication and Educational Technology and have been improved in relation to the 'feedback' we have been getting since 1983.

It is only because the materials have evoked all-round interest among the students and have helped achieve the objectives of the course (as our feedback indicates), I venture to place before my colleagues these materials with a request that they may divest themselves of prejudice , and that they may give a fair trial to these materials, and determine for themselves the effectiveness of the course.

7.0 Acknowledgement

I am thankful to Dr. V. Rajagopalan, Vice-Chancellor, Tamil Nadu Agricultural University, Coimbatore for encouraging me with this work, and for the Foreword he has so kindly given.

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R. Sundarsanam

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Learning Objectives Of The Modules

Module	SUB-MODULES (each of one contact hour)x				
No.	Reading Strategies	Critical Reading Comprehension & writing (Rational completion)	Technical Discourse (Communication Forms: Verbal/Non-verbal) & Interpretation		Listening comprehension and conversation
Sessions:	(A)	(B)	(C)	(D)	(E)
1.	Skimming with a purpose	Extracting meaning from word formations	Functional description		Description by land marks
2.	Pre-reading orientation and scanning	Referential & lexical relationships	Classification (by composition)		Classification (by use)
3.	Pre-reading orientation, skimming and scanning	Collocations and using appropriate expressions	Narration of a process		Clarifying the steps of a process
4.	Surveying and setting up reading expectations	Identifying presuppositions	Description Instruction for an Experiment		Instructing and describing

M. No.	(A)	(B)	(C)	(D)	(E)
5.	Pre-reading orientation and selective reading	Generalisation, evidence and use	Description of properties and uses		Informal exchanges
6.	Reciting and reviewing	Implications and inference	Comparison and contrast (Stated and implied)	A feature story	A analogy
7.	Reviewing and interpreting	Empirical evidence and conclusions	Identification of a Problem and Recommendation	Do's and don'ts	Raising Question for clarification
8.	Note-taking and note-making	Generalization and definition	Definition of processes and states	A technical Bulletin	A playlet
9.	Identitying the orientation of a book (for library reading)	Illustration and inductive logic	Description and definition of relationships (graphs)	A popular bulletin	A lecturette
10.	Evaluating the usfulness of a book(for library reading)	Deduction and analogy	Tabulated data and discussion	A popular leaflet	Formal letters and speeches

x The students are required to complete half the number of tasks in each sub-module in the class, and the other half at home (Ten percent for final evaluation).

A REVERIE

MODULE-1: LANGUAGE-USE IN DESCRIPTION

Session A: *Skimming with a Purpose*

A.1(i) The following passage describes two interesting dreams of Kekule, the dreams which helped him discover the structural formula of Benzene. You will be surprised to know that a dream of figures helped him make the discovery. Deep interest in a subject and figural imagination are important for scientists.

(ii) **Setting up the Purpose**

Find the answer to the following question by skimming over the passage purposefully: Describe the dream he had when he was writing a book; what clues did he get in respect of the structural formula of Benzene?

(iii) **Skimming**

(a) Follow the procedure given below for pre-reading orientation and skimming.

1. Read the question and state what information (:fact) is given out (:presupposed) in the question and what is to be found out.
2. Recall words or information which you may already know on the theme of the question.
3. Read the first and last sentences of each paragraph and guess the paragraph(s) in which the required answer is likely to be found.
4. Read that paragraph(s) thoroughly looking for the answer.
5. Read the other likely paragraphs also for additional information.

(b) Find the answer to the following question by following the procedure for skimming: Describe the reverie of Kekule which suggested a chain structure for Benzene.

A2. Read the questions given under A4, analyse each question for what information it gives out and what to find out, and read the passage for answers.

A REVERIE

1. Benzene is an organic compound. It has an aroma. It smells sweet. Six Hydrogen atoms and six Carbon atoms combine to form a molecule of Benzene. How are they combined in a molecule? They may combine as the carriages are combined in a train, or like the branches of a tree. But such structures do not correspond to the chemical properties of Benzene. Then what is the structure of Benzene? It is stable; yet it could enter into any kind of chemical action--addition, substitution, transformation, and even multiplication. No one knew the answer to this problem. And it was Kekule who made the discovery and solved the problem.

2. The German Chemical Society gave a party to honour him for his discovery. A number of scientists praised him for his services in the cause of science. Kekule wanted to thank his colleagues. So he got up and made a simple and modest speech. He told them how the two great discoveries of his life had come to him.

3. He lived at one time near Clapham Common and often went to Islington. Once he went to spend an evening with his friend Hugo Muller. They discussed many things but mainly their beloved chemistry. It was summer and Kekule went home on the outside of an omnibus. "I sank", he said, "into a reverie. Atoms flitted about before my eyes. I had always seen them, these little beings in movement, but I had never succeeded in interpreting the manner of their movement. That day I saw two small atoms often joining into a little pair. Then a larger one took hold of two smaller ones. And a still larger one clasped three or even four of the small ones and all spun round in a whirling round dance. I saw how the larger ones formed a row and at the end of the chain smaller ones trailed along."

4. "The cry of the conductor, 'Clapham Road', woke me up from my reverie. The picture was still in my mind. I put the sketches of these dream products on paper." Thus originated the structure theory. The idea of the ring structure of Benzene came to Kekule in another reverie.

5. Kekule knew that Benzene was not only a reagent but also a solvent. Benzene fathers many organic reactions and compounds and so the knowledge of its structure was important. This problem gave Kekule no peace and this is how he solved it: "I was at my desk writing a text-book and was getting nowhere. My thoughts were far away. Atoms danced before my eyes. My mind's eye could distinguish long rows of

them writhing hither and thither like snakes. But one of the snakes suddenly caught hold of its own tail and began rotating before my eyes as if teasing me. I started as if awakened by a stroke of lightning.''

6. The casual image of this snake that came up before Kekule's mind suggested a hypothesis. Instantaneously he drew the hexagonal structure of Benzene; it was a great insight. Subsequent experiments proved the correctness of his hypothesis. Kekule narrated these incidents and sat down concluding, ''Let us learn to dream, gentlemen, then perhaps we shall find the truth.''

7. The reverie was good; it acted as a catalytic agent to the mind. The mind branches out in all directions like the roots of a tree in search of solution. It seeks and reacts; it composes and decomposes; it moves and manoeuvres tactfully; in short, it is always in movement, in a kind of tropism, a problem tropism. When conscious search fails the mind begins to play with figures and symbols and lo! the symbols and images carry meaningful clues for a solution. The way of Kekule exemplifies beautifully this process of the mind, a process common to artists and scientists.

(Adapted from ''The Act of Discovery'' by John R. Baker)

A3. Read the fourth/fifth paragraph carefully and answer the questions given below.

(i) What do the following words refer to in the given context?

(Paragraph: 4).	(Paragraph:5)
(a) 'me' in line (1)	'its'in line (3)
(b) 'these'in line (2)	'it' in line (4)
	'them'in line (7)

(ii) Give the contextual meaning of the following words in your own words.

(a) 'products' in line (3)	'fathers' in line (2)
(b) 'Originated' in line (3)	'minds eye' in line (6)
(c) 'ring' in line (4)	'teasing' in line (9)

(iii) Rewrite the sentences beginning with the following words in your own words bringing out its contextual meaning.

(a) The idea_____________reveries (para.4)

(b) I started ___________ lightning (para.5)

A 4. Answer the following questions:

1. State the molecular formula of Benzene.

2. Describe how the mind of a thinker may act whenever there is a problem.

3. Describe the analogy (:example) used by the author to specify how a thinker's mind may work.

4. Describe the scientific value which helped Kekule make the discovery.

5. Was Kekule an absent-minded scientist or an ever-attentive scientist? Give reasons.

Session B: Discourse Logic and Coherent thinking: *Understanding the words in use.*

1. Sets of words with similar prefixes and suffixes are given below:

(i) Attempt to understand the words from the given meaning of the prefixes and suffixes, and
(ii) Provide one or two additional examples of your own.

(a) hydro-meter, hydro-carbon, hydro-lysis
hydro-: -possessing hydrogen atoms
Examples:

(b) geo-graphy , geo-tropism, geo-metry
geo-:
Examples:-

(c) omni-present, omni-scient, omni-bus
omni-:
Examples:-

(d) hydro-lysis, electro-lysis, glyco-lysis
-lysis: ?
Examples:

(e) Chlor-osis, necro-osis, mei-osis
-osis: ?
Examples:

(f) Find out similar prefixes used in the passage and state their meanings in your own words.

2. 'Hexa-gonal' means six-sided. Please give the prefixes used todenote other numbers.

3. Read the following statements and fill in the blanks with suitable words based on the clues provided by the italicized words and on your knowledge.
    (i) Benzene is an organic *compound*; it is not an________; it is not a ____________.
    (ii) It has an *aroma* and hence, it is an ___________________ _____ compound.
    (iii) It was Kekule who *solved* the problem, until then the problem was _______________.
    (iv) Kekule was a *German chemist*; he was born in__________and his most loved subject was_____.
    (v) Benzene is a *stable* compound; its structure will not______due to exposure to air, light, water and heat.

4. Read the given sets of words and note the gradation/relationship in meaning between the words (order or set) and fill in the gaps suitably:
    (a) e.g.addition : subtraction:: oxidation: _______(reduction)
    (b) carriages: train:: branches:________
    (c) following: successive:: commence: ___________
    (d) night: dream :: day: ________
    (e) compose: decompose::join: ________

5. Combine the following sets of statements with suitable discourse connectives selecting them from the given choice of words, and rewrite.

    (i) Kekule is remembered as a great scientist ________ (since, because, so) he was able to discover the structural formula of Benzene.
    (ii) Kekule wanted to thank his colleagues for the honour they had done him. ______(Though, Because, So) he got up and made a short sweet speech.
    (iii) He often went to Islington ______(as, thus, then) his chemist friend, Hugo Miller was living there and he wanted to discuss with him.
    (iv) Kekule had great interest in discovering the structural formula of Benzene. Once he had a reverie. In the reverie atoms combined to form snakes. One such snake, he saw, caught hold of its

own tail in its mouth and whirled round. __________ (Thus, This, So) a reverie provided Kekule with a clue to the structural formula.

(v) Kekule had a reverie. The reverie indicated a ring or cyclic structure for Benzene. _____________This, So, Thus) he set up experiments to verify the probability. The experiments proved his theory of ring structure. _______(This, So, Thus) originated the structural formula of Benzene.

6. Rewrite the following passages by completing the statements with suitable words.

   (i) Benzene is both a solvent and a reagent. However, water is only a solvent and not_________.

   (ii) Benzene molecule is made of six atoms of Carbon and six atoms of Hydrogen. They may exist structurally combined like the carriages ______or like the branches_________.

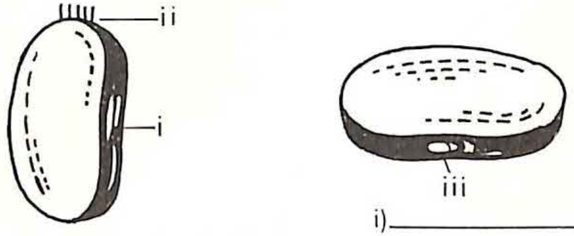
   (iii) The mind of a thinker may work in many ways. It may branch out like_______ spreading out in all directions or, may act like_________of the tree going along in one _______and _______ a problem as the roots circumvent a stone or any other obstruction.

Session C: *Functional Description and Related Verbal /Non-verbal forms*

1. Functional Description of an object/item is fundamental to any scientific study. It generally involves (a) describing the shape, size etc. in terms of their usefulness, (b) naming the important parts of the object and (c) describing their unique/characteristic features (:identification marks).

2. The following passage is a description of the wheat grain. A Figure of the wheat grain is given below. Read the passage and name the parts of the wheat grain.

(Wherever diagrams /figures are found in a text-book, first attempt to understand them and use them to understand the verbal description which may accompany the diagram/figure).



i)____________________

ii)____________________

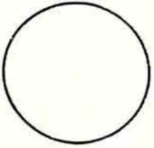
iii)____________________

a____________________ b__________?__________

Fig. 1. Different views of the Wheat Grain

3. The wheat grain is approximately 7mm long and 4mm wide though the grains may be lean or plump with the general form being that of an oblate spheroid. The dorsal side or back of the grain is smoothly convex but the ventral surface has a deep groove along its length. At the base or proximal end of the grain on the dorsal surface there is a small distinct patch shaped like a shield. This region contains the embryo and while only comprising about a tenth of the grain, it is the vital component. The remainder is the endosporm which is the food reserve used by the young seedling during and after germination. At the top or distal end of the grain there is a characteristic mass of long hairs called the brush.

4. Name the shapes of the following diagrams (in two-dimensional and three-dimensional forms):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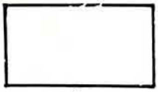
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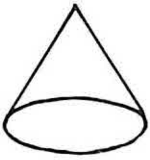
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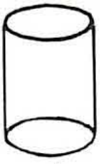
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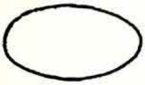
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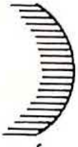
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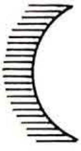
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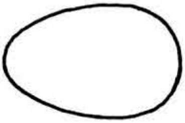

h

5. Every technical passage involves (a) selection of appropriate information and (b) organization of the information in a particular order. Identify the information in the passage and the order in which these have been presented in the passage. State the information in your own words and in the following order:

   1. Shape -general
   2. Texture of the surface
   3. Length and width
   4. Identification mark - (i)
   5. -Do- - (ii)
   6. -Do- - (iii)
   7. Statement of importance of an identified feature.

6. Following the above example describe the shape of the following objects: (a) Potato, (b) Pin cushion.

Session D: *Cloze Text for Integrated Grammar*

1. The following passage is another version of the text 'A Reverie' but with a number of words deleted systematically. Read the following passage forwards and backwards and fill in the blanks with suitable words. Each blank will accept only one word; the first letter of the word is given for guidance.

   To scientists even a dream of a figure or shape may provide clues for discovering solutions to problems. An example is that of Kekule who discovered the structural formula of Benzene.

2. The structure of Benzene was a mystery to many chemists. It is an organic compound with a sweet smeil; -1(i) - molecular composition is six hydrogen atoms and six- 2(c)- atoms. It is a stable compound, however, it-3(c)-enter into all kinds of chemical actions.The -4(p)- was that no one was able to find -5(o)- its structure. It was a reverie which helped -6(K)- , a German chemist to discover the formula of -7 (B)-.

3. The structure theory of Benzene came to Kekule -8(i) a reverie he had while travelling in an -9(o)-. Kekule was living near Clapham Common. One day -10(K)- was returning from Islington in an omnibus. Then -11(h)- fell into a reverie.The atoms flitted about -12(b)- his eyes and he saw two small atoms -13(f)- joining into a pair and then a -14(s)- one taking hold of two smaller ones and -15(a)- the end, all spinning round in a whirling -16(r)- dance. The larger ones formed a row and -17(o)- at the end of the chain smaller ones -18(t)- along. In the meanwhile as the omni bus had -19(r)- Clapham Common, the conductor shouted that he had -20(a)- Clapham Common. The scream brought him back from -21(h)- reverie. He thought that there was a clue -22(t)- the structure of Benzene. So he drew a -23(f)- of the way in which the atoms combined -24(i)- the reverie. It was linear in structure and -25(i)- did not satisfy Kekule.

4. He felt that he -26(h)- not yet discovered the structure of Benzene. One -27(d)- he was at his desk writing a book -28(w)- his mind was thinking about the structure of -29(B)-. There appeared before him, soon, long rows of -30(a)- writhing like snakes.

5. Suddenly, one of the snakes caught hold of its own tail and began rotating before his eyes. This image was so unusual that it brought him back from the reverie. He thought the image carried a clue for the structure of Benzene. He drew a diagram combining the figures of the two reveries, and there he saw a hexagonal structure. So he hypothesised that the structure of Benzene was hexagonal. He then undertook experiments to verify the hypothesis. To his surprise, the experiments proved the hypothesis. From this you will understand that even reveries and dreams sometimes offer clues to the solution of problems.

Session E: *Listening Comprehension and Conversation (Functional Description)*

1. Listen to the conversation and answer the questions (that follow) relating to the ways by which locations are named and identified. (Keep the book closed while listening).

Student : Excuse me, Sir, I wonder if you can help me.
Teacher : Sure with pleasure.
S : I am new to this place. I have come to attend an interview. May I know where the interview is conducted?
T : I see. Look at the clock tower building. To its west is a tall building with the name-board "Anna Auditorium". To its south, there is a red brick-building with a frontage of four tall square stone pillars. The interview is conducted there; It is known as the Freeman Hall.
S : Thank you; could you tell me a few more landmarks around that place.
T : O.K. There is a board with the name "Freeman Hall" on the front wall of the building. Further, there is the college of "Horticulture" in front of the Hall. When you stand facing the Horticultural college you will see to your right the college playgrounds.
S : Thank you very much for your help, Sir .
T : You are welcome.

2. Questions
   (a) State how 'Anna Auditorium' and 'Freeman Hall' are identified.
   (b) State the direction in which the 'Freeman Hall' lies to the clock-tower building ?
   (c) State, in your own words, how you will check up if you have arrived at the 'Freeman Hall'.

3. Participate in the following conversation suitably. The scene is the college Library.

Student : Excuse me Sir, I wonder if you can help me ?

Librarian : ____________________

S : I am looking for the book " Management by Objectives" by Peter Drucker.

L : ____________________

S : I searched the sixth shelf; as per index I should find it there.

L : ____________________

S : Yes. it is. It is considered the best book in the field.

L : Then you better ____________________

S : Oh! Is that so ? Why do students keep the books on shelves meant for other subjects ?

L : By this, they make sure that these books are available only to them whenever they want it. Make sure you __________

S : Oh! I see. I shall search behind all the old bulky books. Thank you for the tip____________________.

L : Please____________________.

S : Sure, I will leave the book on the table. Bye.

L : Bye .

MODULE 2: LANGUAGE-USE IN CLASSIFICATION

Session A: *Pre-reading orientation and scanning for information.*

1. (i) The following article, "THE RIGHT SHAPE FOR THE GAME" is taken from the "New scientist". As soon as you read the caption (Title/Sub-title), you should attempt to recall "information" related to the word in the caption, which you may know already. This will help you learn to read with meaning.

(ii) **Pre-reading Orientation**

Answer the following questions given to help you recall what you may already know on the given topic.

(a) Name the games and events which form part of international meets like the Asiad, Olympic games, etc.

(b) Name the games in which our countrymen are considered to excel.

(c) In a running race, who do you think is likely to win: a lean man or a fat man? Give reasons.

(d) List a few words with which you may classify people according to their shapes and sizes.

(e) List a few words with which you may classify people according to their temperament.

(iii) **Scanning**

(a) Find answers to the following questions by scanning the passage.

(1) Give the names of the athletes and the games/events in which they participated.

(2) What, according to research findings, is the most advantageous shape to win the prizes and medals in sports?

(3) Can a person with physical disadvantage make a mark in sports? If so, how? Give an example.

(b) Follow the procedure given below for scanning.

(1) Read the first sentence of the paragraph, then (2) glance through the paragraph moving your eyes over (a) proper names and (b) statements given within quotation marks and

(c) words around full stops or question marks and finally(3) read the last sentence of the paragraph. If the paragraph is long, you may read one or two sentences in the middle also. While thus scanning each paragraph, (4) relate these items to the given questions and keep looking for the required information (:answers).

A 2. (i) Read the questions given under A4, analyse the questions for (a) the information given and (b) the information sought for. Then read the passage for answers.

(ii) The Right Shape for the Game

1. What shape of man makes an athletic champion? Within reason, fitness, determination and judgement. And this would seem to be borne out by the 800 metres final at the 'Rome Olympics' when six men of all shapes and sizes lined up.The first was the tall and muscular Peter Snell of New Zealand; the second was the lean Roger Moens of Belgium; the third was the tall and muscular George Kerr of the West Indies, and the fourth was the small and strong Paul Schmidt of Germany. The commentator exclaimed to me that the athletes, who had lined up, were of assorted sizes and shapes. I told him that the race might indicate what shape was most advantageous to a fast runner.

2. Researchers in the United States and Britain have found that the honours in sports go either to the well-built muscular mesomorphs--they are the kind of bodies which grace the covers of many physical culture magazines for men--or to the lean well-defined ectomorphs. It appears that the well-rounded easy-going sociable endomorph is wasting his time if he puts on a sports shirt, shorts and spikes. Who would expect to see a fat, sweating and puffing man-mountain participating in a sprint?

3. This is probably something most of us know anyway, but the physical educationists in England suggest there are some subtle differences in potential athletic capacity between mesomorphs and ectomorphs. The first group produces the sprinters, the weight-lifters and the throwers, while the second group produces the middle and long-distance runners and jumpers. Some athletes, however, such as javelin throwers and high jumpers, appear to be betwixt and between.

4. With differences in build go differences in taste and temperament. The mesomorphic athlete shows a pronounced tendency to extroversion. He behaves assertively and tends to enjoy power and risk. The ectomorph who is much more of an introvert is more shrewd and calculating. But both groups love to command people like this: ''Go straight and at the end of the corridor turn right for my room. Open my chest and bring my spikes quickly. If you turn left by mistake you will land yourself in trouble. That is where the ladies room is.'' Both groups love to assert and dominate in speech and action.That is their dominant character, whatever may be their form and shape.

5. This is a field which requires to be investigated much more carefully before general conclusions can be made. What has been established, however, is that the broad-chested, slim waisted mesomorph is at a distinct disadvantage in certain types of events. To put it in another way, his superb physique gives him an ''edge'' only in certain events such as sprinting and weightlifting and in certain sports such as boxing. If the boxer is an endomorph he would be finished with the first punch. If Zatopeck, known as the human locomotive, had been an endomorph he would not have won an Olympic Gold Medal at all. Many ectomorphs have proved to be great musicians and artists.

6. There are always exceptions. Though King Kong had been a man-mountain, he was able to establish his greatness as a wrestler. Probably what one is inclined to become depends upon one's will. Our best sprinter Peter Radford is more of an ectomorph than a mesomorph. On the other hand, the world champion high jumper, Valeri Bruner of Russia 'fits' exactly the researchers' conclusion that the best men for this event are a mixture of meso-and ectomorphy.

(Adapted from 'New Scientist', 6th April, 1961, 9:229,p.854)

A.3. Read the fourth/fifth paragraphs carefully and answer the questions given below:

(i) What do the following words refer to in the given context ?

(Paragraph 4)	(Paragraph 5)
(a) 'He'in line (3)	'his'in line (5)
(b) 'both groups' in line (5)	'him'in line (5)
(c) 'you'in line (7)	'he'in line (7)

(d) 'their'in line (9)   'he'in line (9)

(ii) Give the contextual meaning of the following words in your own words.

P4	P5
(a) 'temperament': line (1)	'edge': line (5)
(b) 'calculating': line (5)	'first punch': line (7)
(c) 'spikes': line (7)	'human locomotive': line (8)

(iii) Rewrite the sentences beginning with the following words bringing out their contextual meaning.

(a) With differences __________ temperament. (line 1) (para 4)

(b) If Zatopeck ________________ at all. (lines 7.9) (para 5)

A4. Answer the following:

(1) Specify the physical features of the runners of the 800 metres race.
(2) State the types of games/events in which the mesomorphs and ectomorphs generally excel.
(3) State the general belief which relates one's social character with one's physical shape.
(4) Explain what made the fat King Kong become a great wrestler.
(5) Do you think every scientist should have the ability to classify objects/items according to some principles? Illustrate your answer.

Session B: *Discourse Logic and Coherent Thinking: Understanding the Context and using appropriate words.*

1. The words used to describe different shapes like endomorph, mesomorph and ectomorph are combinations of commonly used prefixes and suffixes. You may come across similar combinations in almost all technical texts. Attempt to (i) understand the subject-related meaning of these words and (ii) provide one or two additional examples of words using the italicized prefixes or suffixes.

(a) *endo*-morph: *(meaning in Biology)* ____________________ additional example ____________________

(b) *meso*-morph: (meaning in 'Biology')______________

(c) *ecto*-morph: (meaning in 'Biology')________________

(d *a*-morphous: (in 'Chemistry')__________________

(e) *Iso*-morphous: (in 'Geography') ________________

(f) *Iso*-therm: (in'Geography') __________________

(g) *Thermo*-dynamics: (in 'Physics')___________

2. Certain words may generally occur in company in certain contexts as in the following example:

e.g.South Indian (context) _______Breakfast : Idli, Sambar, tea, cup and saucer. You may understand the given context from the presence of these words; or given the context, you may anticipate the occurrence of these words.

(i) Identify the given context from the given list of words.

(a) Advocate, plaintiff, argument, judgement: _________

(b) Silence, reference books, journals, researcher:________

(c) Police, teargas, crowd, ambulance: _____________

(d) Spikes, shorts, track, starter:_____________

(ii) Form a list of words which may go together under the given contexts:

(a) context *classroom*: students, ______,______,______.

(b) *Cell structure*; cell wall, _____,_______,______.

(c) *Disco dance*: guitar, ______,______,______,______.

(d) *Social behaviour*: friendly, ______,______,______.

(e) *Sprint event*: short distance running ,_____,_____,___.

(iii) Find the overall context and the odd word in the following groups of words.

(a) Syringe, vial, cotton, nurse, soda: : context:_____, odd word:_____

(b) Soil water, membrane, magnet, pressure, specific gravity: : context:_______, odd word ______

(c) Pollinator, anthesis, anther, butterfly,leaf: :con text____, odd word:______

3. Fill in the blanks with appropriate words.

e.g. It is not ______*cold* and hence I have removed my woollen sweaters. (ice, freezing, damn) *ans*: freezing

(i) The Inspector _____(shouted at, ordered, roared at) him like a lion and the policeman kept quiet not knowing what to do.

(ii) How do plants _____(perceive, see, sense) gravity? If we know its mechanism, we may use it to _____(alter, remove, rub out) the gravitational sense of weeds and thus to _______(impede, affect, hinder) the growth of weeds.

(iii) Sir Isaac Newton _____(innovated, invented, discovered) the laws of gravity and the laws are _____(called, known, entitled) as the Laws of Motion.

(iv) What shape of man makes an athletic ____(expert, champion, leader)? Researchers have been ____(undertaking, carrying out, studying) investigations to find an answer to this _______ (problem, issue, question). What has been _____ (finalised, concluded, established) is that morphic form is not suited for sprint events.

4. Read the following statements, understand the time relationship signalled by the statements and fill in the blanks with suitable forms of the action words given in brackets.

(i) *Before Kekule discovered* the structural formula of Benzene no one _____(know) for certain how the atoms of carbon and hydrogen are_________(combine) in Benzene.

(ii) Atoms *flitted* about before Kekule's eyes; two small atoms _____(join) into a little pair and then a larger one _______(take hold) of the smaller ones and ________(form) a row. This process ______(go) on until he *saw*, long rows of atoms writhing like snakes.

(iii) Different shapes of man *seem* to indicate differences in social behaviour also. The fat person ________(be) generally friendly, he____(enjoy) humour and does not ____(tend) to be self-centred. The lean person, on the other hand, _____(tend) to be self-centred and ____(prove) to be an introvert.

(iv) We know that Marconi ______(invent) the radio, but what we may not _____(know) is that he ______(work) hard at it for many years and ______(face) many failures before finally succeeding.

5. Words like can, shall, may, will, must, etc., signal certain notional meanings like probability, possibility, ability, certainty, etc. Read

the following sets of statements and indicate what specific notions are signalled by these words (modals).

(i) All organisms *must* work to live.

(ii) What shape of man makes an athletic champion? Sports events *may* provide an answer to this question.

(iii) Atoms danced before Kekule's eyes and soon each atom joined into a pair and formed rows. He *could* distinguish long rows of atoms writhing like snakes.

(iv) Mesomorphic form is well-suited for boxing. However, if a boxer is endomorphic, he *would* be finished at the first punch of a mesomorph.

(v) An athlete *may* be an endomorph or an ectomorph; but the person *will* be dominant in speech and action.

6. Read the following passage and complete it suitably. (Understand logical development of the passage as signalled by the discourse connectives and use the redundant information suitably to complete the passages) .The blanks may take one or more words.

(i) Generally endomorphs prove to be poor wrestlers. However, King Kong who was an endomorph proved ______. Thus there are ______to the rule.

(ii) Endomorphs have not won Olympic medals in long-distance running events. Geiger is not an endomorph; he is a tall ectomorph. Hence, it is likely that ________.

(iii) Mesomorphs with broad chests and slim waists are considered to possess attractive athletic physique. So the pictures of _____mesomorphs are often published in the magazines of physical culture.

(iv) What makes a person a great athlete is will and hard work. For example King Kong. He was very fat, yet he ______a great wrestler because he_____to become ______.

(v) Zatopeck was tall, lean and lanky and hence, he could win all the long-distance running events in Rome Olympics. If he were not______he would not have won_______.

Session C: *Classification and Related Verbal/Non-verbal forms*

1. Classification of objects and things is a scientific activity which helps to develop concepts and also to deal with them in a systematic manner. It involves (a) setting up certain principles or characteristics, (b) grouping the objects/things accordingly into classes and (c) naming them. This process may be carried on from one level to the next lower level according to one's needs.

2. The following passage deals with 'Soil classification'. A table relating to this is given below. Study the table and attempt to understand the principles of classification. Then read the given passage and fill in the columns in the table suitably.

Table 1: Classification of soils: Chemical Composition

No.	Name of the soil	Dominant mineral composition	Other chemical characteristics
1.	Pedocals	Calcium	a?
2.	Pedalfers	b?	No bases
3.	Siallites	c?	--
4.	Allites	d?	--
5.	Chernozem	e?	--

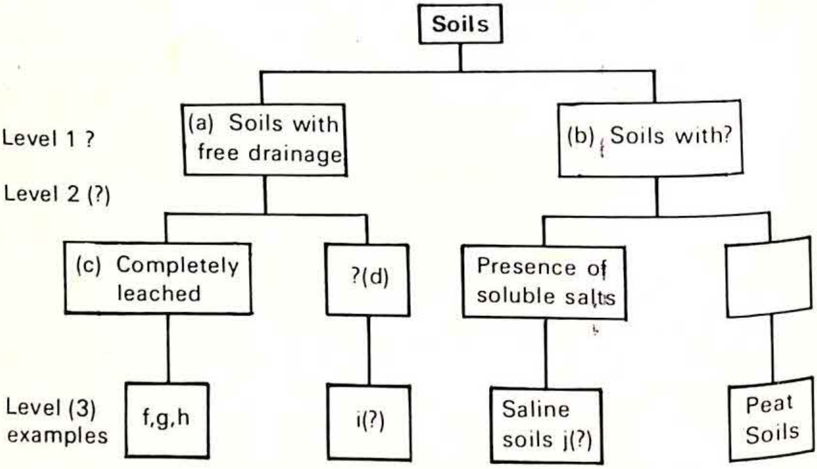
3. The Genetic Grouping of Soils

A variety of terms have arisen in this connection. Pedocals are soils with insufficient drainage or leaching (:to remove the calcium) as in Chernozem. Pedalfers are soils from which bases are removed and sesqui-oxides in one way or another are dominant. In Siallites, silica and aluminium are dominant; in Allites the aluminium is high and so on.

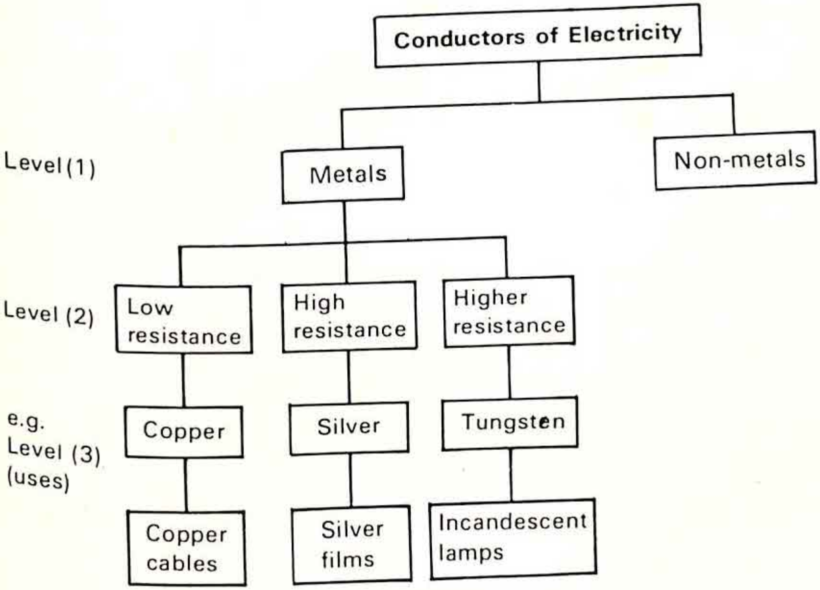
In sedimentary soils, the parent material will always have a determining effect on the physical properties of the soil. Clay will always form heavy soil, and sand light soil; but the chemical changes will be on the lines described above.

4. Soil may be classified according to their physical and chemical properties. The classification may be made in the following form

(: chart) also. Complete the form identifying the principle of classification and sub-classification at each level of categorisation.



5. Look at the following classification chart and write on "Conductors of Electricity."



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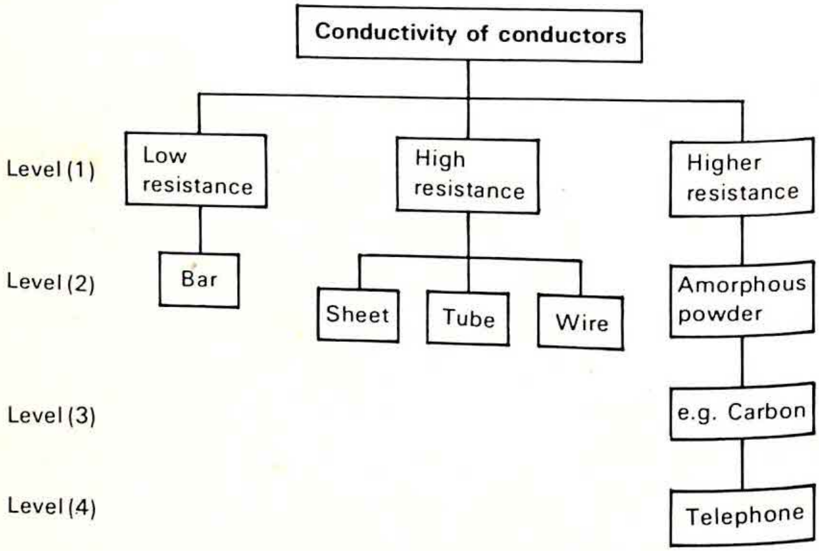
6. Read the passage on Soil classification and identify (a) what information has been selected and (b) the order in which they have been organized. Then read the following chart and write on "conductivity and classification of conductors" in the same manner.



Session D: *Cloze Text fot Integrated Grammer*

1. (i) The following passage is another version of the text given under (A3) but with a number of blanks occurring systematically. Read the following passage carefully and fill in the blanks with suitable words.

The Right Shape for the Game

The success of any scientific study depends on one's ability to classify objects and experiences according to certain principles, and to draw useful generalizations. In the following summary you will find how human beings are classified according to the shape of the body, and how each shape helps a person to excel in a particular field of sport.

2. Human beings are classified into three -1- according to their physical shape and -2- . First, the well-built muscular mesomorphs, the -3- the lean well-defined ectomorphs and -4- third category well-rounded, easy-going sociable endomorph.

3. Researchers -5- that the honours in sports go -6- to the mesomorph or to the -7- , and the endomorph is wasting his -8- if he participates in sports. Most -9- the successful sprinters, the weight-lifters and -10- throwers are mesomorphs. The middle and -11- runners and the jumpers are ectomorphs. -12- athletes such as javelin throwers and -13- jumpers are either mesomorphs or ectomorphs. -14- is also difference in their social -15- similar to the differences in physical -16-. The mesomorphic athlete is an extrovert -17- tends to enjoy power and risk. -18- ectomorph is an introvert who is -19- shrewd and calculating. But both groups -20-command people.

4. We cannot say that -21- particular shape of man makes for -22- athletic champion. If one has basic -23-, determination and judgement, he can, whatever -24- be his shape, become an athletic -25- . In the 800 metres final at -26- Rome Olympics, the six men lined up are of -27- shapes and sizes. First was tall -28- Peter Snell, second lean Roger Meons, third -29- muscular George Kerr and fourth small strong Paul Schmidt.

5. Once it was held that sports -30- invented only for the mesomorphs. -31-, recent research studies have proved that -32- excel only in a few events -33- they are at a definite disadvantage -34- certain types of events. Many ectomorphs -35- not only good sportsmen but also great musicians and artists. In every field there are exceptions. Therefore, the field of sports is no exception. Though King Kong was a man-mountain he established his greatness as a wrestler. Therefore, what one is to become depends more upon one's will than upon one's physical shape.

(ii) After filling in the blanks, check up your answers with the clues (first letters of the words) given below: 1k; 2s; 3s; 4t; 5s; 6e; 7e; 8t; 9o; 10t; 11l; 12T; 13t; 14T; 15T; 16s; 17w; 18T; 19m; 20l; 21a; 22a; 23w; 24m; 25c; 26t; 27d; 28m; 29t; 30w; 31H; 32t; 33a; 34i; 35a.

Session E: *Listening Comprehension and Conversation: classification in terms of 'use'.*

1. Listen to the following conversation and answer the questions that follow:

Ram : Hello Gopal. What happened to you?
Gopal : Nothing serious; just a small accident.
R : Well, what did you do?
G : Accidently the test-tube fell splashing Con. $HNO3$ all over my shirt.
R : I'm so sorry to hear that. But,...don't you put on the overcoat before going to the chemistry lab ?
G : Oh yes, I generally do. But I forgot today.
R : Well, you're lucky you had put on a cotton shirt. Supposing it was a terylene shirt or such other stuff.
G : Very true, then it would have caught fire. Well, I have learnt a few lessons; in fact, I was then distracted by someone laughing aloud.
R : Be careful while you are in the lab.
G : Thanks, Bye.
R : Bye.

2. Questions

(a) What is the cause of the stains in the shirt of Gopal?
(b) State the lessons which Gopal has learnt from the accident.
(c) State why one should not wear terylene or other synthetic clothes while working in the chemistry lab or in the kitchen.

3. Participate in the conversation filling in the blanks with suitable statements. (The conversation is taking place in a classroom)

Teacher : Give me some examples of living and non-living things in our classroom, Ram.
Ram : Sure, Sir.____
T : Well, that's good. I would like the non-living things further classified into two broad groups. Will you do it?

R : Oh, Yes________________.

T : Well, you're giving examples belonging to the group; but I______.

R : Oh, I see, you want me to state the principle first. The division is based on the distinction between metals and non-metals.

T : Very good , Ram. Rahim, would you sub-categorise metals in terms of their uses, that is, how they are used in the classroom, like furniture, outfittings, etc.

R : Pardon

T : __________

R : Well, some metals are used as electrical conductors , some as lids or covers, and some as nails.

T : That's good. Robert, will you tell me in what forms copper has been used in the outfittings.

Robert : Well __________

MODULE 3 : NARRATION

Session A: *Pre-reading Orientation, Skimming and Scanning*

A1(i) The following passage describes how Alexander Fleming discovered Penicillin. A fine sense of observation and awareness helped him discover 'penicillin' from an 'incident' which happened in his lab. (Scientific Value).

(ii) **Pre-reading Orientation**: Answer the following questions on the passage, "The Discovery of Penicillin" (recall from general knowledge).

(a) Name a few antiseptics which are in common use, and the contexts of their application (e.g. dettol--bruises)
(b) Name a few diseases and the organisms which cause them.
(c) List a few words which are generally used in association with common cold, fever, T.B. and dog-bite.
(d) Name a few scientists who have contributed to the development of medicine and surgery.

(iii) Skimming and Scanning

Read the questions given under A4, analyse them for presuppositions, select a question and scan the passage (: read the first sentence, proper names, quotations, known words and last sentence of each paragraph). Guess the paragraph (s) where you may find the answer for the selected question and read them. Repeat the procedure till you get all the required answers. Answer the questions orally.

A2 The Discovery of Penicillin

1. Pasteur discovered germs and Lister killed them. These two men together revolutionised the theory and practice of medicine. Germs can be destroyed by heat. They can be poisoned by certain chemicals called antiseptics. Carbolic acid is one such antiseptic used by Lister.

The object of antiseptic method was to stop germs from entering the body. But the cure of disease was a more difficult problem, for here the germs had already entered the body. The antiseptic could kill the germs, but the chemicals that destroyed the germs could also destroy the cells of the body. It means that injecting carbolic acid into the body inasmuch a dose as would kill all the germs, would kill the patient also.

2. It was a bacteriologist named Matchnikoff, a pupil of Pasteur who revealed the true nature of the problem. He discovered the white cells of the blood, which are called leucocytes. He showed that these cells rush out to join battle with the germs, like soldiers answering a bugle-call. He showed that any disease was, in fact, a fight between the leucocytes and the germs. Now the problem was to find something that would attack only the germs and not destroy the fighting leucocytes. The man who took up the problem was Alexander Fleming.

3. As luck would have it, Sir Almroth Wright and Fleming worked together. They had some doubts with regard to the efficacy of injecting antiseptics. They felt that the surgeon's aim should be not so much to kill the germs with an outside agent as to help the leucocytes to do their natural germ-killing work. And in 1922, after about 20 years of research, he discovered an antiseptic manufactured by the body. He made the discovery by, what he modestly called, an accident. He was suffering from Catarrh and began to examine his own nasal secretions, cultivating them on plates spread with agar, a jelly-like substance used as a nutrient in germ culture. In these secretions he discovered a substance that destroyed the microbes in the culture plates. He called it lysozyme. This was the first natural antiseptic that was harmless to the cells of the body; Penicillin was the second.

4. Another accident helped Fleming discover the penicillin. If Fleming had not developed a finer sense of observation and awareness he would have missed it. The more a scientist is observant the greater are his chances of discovering new things. One morning, as was usual with him, he took out the plates on which had grown colonies of Staphylococcus, a common germ.

5. "As soon as you open a culture plate," he said afterwards, "you are asking for trouble. Things drop from the air. One of those bits of trouble happened to be Penicillin. A mould spore, coming from I don't know where, dropped on the plate." Soon the mould grew brush-like and the microbes around it began to disappear. Immediately, he made a pure culture of the mould and tried its effect on other bacteria. Some grew right up to it; others like the Staphylococci stopped short inhibited by its anti-bacterial action. Thus, he discovered the Penicillin in 1928. A team of workers worked on and succeeded in manufacturing it in 1941. In 1943, it reached the Eighth Army in Egypt and helped in saving a large number of wounded soldiers.

6. Though he had made a great discovery, Fleming was modest. "Everywhere I go people thank me for saving their lives," he said. "I don't know why they do it. I didn't do anything; nature makes penicillin, I just found it." Alexander Fleming joined the ranks of Pasteur and Lister by making a historic contribution to medical science. He won honourable place in the hearts of men.

(Adapted from Patric Pringle's "The man who found penicillin")

A3. Read paragraph 5 of the text carefully and state what the following words mean (i) in general use and (ii) in the place of their occurrence in the text.

(i) General meaning			(ii) Contextual meaning]
e.g. You (11):] hearer			Any scientist]
(a) a culture plate	(11)		______
(b) things	(12)	..	______
(c) a mould spore	(13)	..	______
(d) a pure culture	(15)	..	______
(e) inhibited	(16)	..	______

A4. Answer the following questions. (Questions are not given in the order in which relevant paragraphs occur in the passage).

(a) State how he understood that Penicillin was antiseptic in function.

(b) Name the first known 'antiseptic' and state where it can be applied and where it should not be applied.

(c) Name the germs which were grown by Fleming for experimental purposes.

(d) Name the first natural antiseptic found by Wright. Narrate how it may be cultured.

(e) Describe what happens in the body-system when there is infection.

(f) Is 'Penicillin'a natural antiseptic? Give reasons.

Session B: *Discourse Logic and Coherent Thinking: Contextual meaning and use of appropriate words.*

B1. Sets of sentences are given below. Fill in the blanks in each set appropriately from among the words given in brackets (while reading a science text you must observe how words like those given below are used by the authors). Frame sentences of your own using the given words.

(i) (a)The plant -(a)- that there is some pest attack.
  (b) An examination of the roots -(b)- the presence of nematodes.
  (c) The study -(c)- the theory of elasticity. (proves, shows, reveals)

(ii) (a) Application of 2T oil increases the -(a)- of the machine.
  (b) The use of audio-visual aids increases the -(b)- of class room learning.
  (c) Tests are carried out to prove the -(c)- of the chemical in controlling the root-rot disease. (efficacy, efficiency, effectiveness)

(iii) (a) Lysozyme - an antiseptic is -(a)- in the nose.
  (b) The white cells are -(b)- in the bone marrow.
  (c) The egg-cells are -(c)- in the ovaries.(produced, manufactured, secreted)

(iv) (a) -(a)- of different kinds of pathogens are seen in the culture plates.
  (b) -(b)- of Brown Plant Hopper are found advancing into the fields.
  (c) -There are a number of -(c)- of weeds in the fields; they need to be removed. (columns, pockets, colonies).

2. (i) Words like ______'brush-like (microbes)' 'filament-like' are generally used in technical writing to describe the form/ shape/appearance of a thing. Give five phrases which may contain similar descriptive modifying words.

   e.g. (a) Brush-like *microbes*
   (descriptive (*Head word*) word)
   Statement: The microbes are brush-like in shape.

   (ii) Sometimes there may be more than one modifying word in a phrase. Read the following examples and rewrite them in the form of statements. The order of occurrence of modifying words may signal different meaning.

   e.g. (a) The first natural *antiseptic*
   (2) (1)
   (b) A pure culture of the *mould*
   (2) (1)
   (c) A short-term non-lodging high-yielding *crop*
   (3) (2) (1)
   (d) A short-term high-yielding non-lodging *crop*

   (iii) In the phrases given above, you will notice the use of 'a' and 'the'; collect three examples of phrases each beginning with 'a' and three with 'the' from the text and write them in the form of statements.

   (iv) Expand the following words with suitable modifiers: (a) rose, (b) potato, (c) table.

3. You will find below sets of statements with blanks; there is a meaning relationship between the words (italicized) in one statement and the blanks (words deleted) in other statements. Read once or twice, understand the meaning relationship and fill in the blanks with appropriate words. You may fill in a blank with one or more words.

   (i) Pasteur discovered germs and Lister *killed* them. Germs ____by heat; they can also be _____by chemicals.

   (ii) The carbolic acid would *kill* both the germs and the white cells. So the problem was to find a chemical ________ ___________ only the germ and ______the fighting white cells in the body.

(iii) In the experiments carried out for discovering an antiseptic which would be harmless to the white cells, Almroth Wright and Fleming discovered a substance called lysozyme. This was the *first* natural antiseptic. Penicillin was the ______. And the ________is the Terramycin.

(iv) Some dust fell on the *culture plate* and Fleming found that a *mould* grew brush-like and the ______around it began to disappear. Then he made a pure ______of the _____and tried its effect on other _______.

4. You will find sets of statements with blanks. Fill in blanks suitably with 'and' or 'or'.

(i) The wheat grain is approximately 7 mm long_____4mm wide; the grain may be lean _______plump. The dorsal side _____ back of the grain is convex in shape _______smooth to touch.

(ii) The germinating part ________the embryo is at the base of the grain; the other parts contain the endosperm _____the food which the seedlings use during ______after germination.

(iii) Pasteur and Lister revolutionized the theory______practice of medicine. Germs can be destroyed by heat _____by antiseptics. If carbolic acid is injected into the body, it would kill the germs ____also the cells of the body.

5. Read aloud the following statements and identify the words which have *unusual* spelling forms and sound (spoken) forms.

(i) As he was suffering from catarrh, he began to examine his own nasal secretions.

(ii) In these secretions he discovered a substance called lysozyme. He found that this had an antiseptic effect on bacteria.

6. Several sets of words are given below. Some pronounce them alike. However, each word occurs only in specific contexts . Give two or three words which may occur in association with the given word in each set.

e.g.	disease	decease
	illness	death

	flu	bury	
(i)	(a) cell	(b) sell	(c) shell
	______	______	______
(ii)	(a) germ	(b) gem	
	______	______	
(iii)	(a) asserted	(b) assorted	
	______	______	
(iv)	(a) shots	(b) shorts	
	______	______	

Session C: *Narration of Process and Related Verbal/Non-verbal Forms*

C1. A Process is made of one or more events (changes) and has a beginning and an end; narration of a process will deal with the following three important things:

(a) Naming the elements (which take part in the event),
(b) Describing the part which initiates the action for change, and
(c) Narrating the changes that take place.

The following schematic diagram represents the process of 'respiration'in a cockroach; complete the missing labels in the diagram by reading the passage that follows the diagram. When you read a science text, attempt to understand the diagram first, and then proceed to the reading of the passage.

	Element	Form/kind of action		Changes		
(i)	Abdomen	contracts		Front holes		Hind holes
		---->		[a?]	+	[b?]
(ii)	Front Holes	close		[Air in the front holes		
	------>	[c?]	---->	[d?]		
(iii)	Abdomen	Expands		[g?]	+	f?<----[Air]

C2. The following passage, 'Respiration in Cockroach' is a model of a narration of a biological process. Before starting to read the passage, recall words that you may know already in association with such items like 'respiration' (:for example, human respiration) and 'Cockroach' (which form part of the title of the passage).

(i) Human Respiration (ii) Cockroach
(a) Element: ____, ______, ______ (a)Names of parts:

(b) Kind of action: ___,___, ___ (b) ________
(c) Changes:_______, _____, _____ (c) ________

C3. **Respiration in the Cockroach**

It is possible that the ancestors of the cockroach or of other arthropods had a circulatory system with haemoglobin since they are believed to have had annolid-like ancestors. As the primitive arthropods evolved, however, blood became increasingly less important for land-dwelling forms in the transport of oxygen and carbon dioxide. Some insect larvae have haemoglobin in their blood, but apart from these, the blood of insects lacks haemoglobin. They contain another pigment, haemocyanin, which also carries respiratory gases to a limited extent. Further, they have tracheal tubes which carry oxygen to the cells.

The cockroach has ten pairs of openings on the sides of its body. These lead to a series of tracheal tubes that extend throughout the body.

The cockroach pumps air through these tubes by contracting and expanding its abdomen. When the abdomen contracts, the front holes close and the hind six pairs of holes open. This forces the air through the tubes and eventually out of the body. The tracheal tubes branch repeatedly and reach all parts of the body. The inner ends contain a fluid. The oxygen dissolves in the fluid and then diffuses into the cells. Carbon dioxide moves in the reverse direction also by diffusion and the movement of the air through the tracheal tubes.

(*Biology--An inquiry into life*, Vol. II pages, 637 -638).

C4. Answer the following questions:

(i) Bring out the similarities and the dissimilarities between the human respiration system and that of the cockroach in a tabulated form.

(ii) Name the gases which the author calls as respirating gases.

(iii) Describe the relationship between the following items:

(a) haemoglobin - haemocyanin
(b) front holes - back holes
(c) tracheal tubes - haemocyanin

C5. Complete the following statements which signal (: linkwords are italicized) process-relationships like (a) condition ------> effect/ result, (b) first action ---->second/subsequent action, and (c) one action<---->another action.

(i) The cockroach contracts the abdomen *so that* ________.

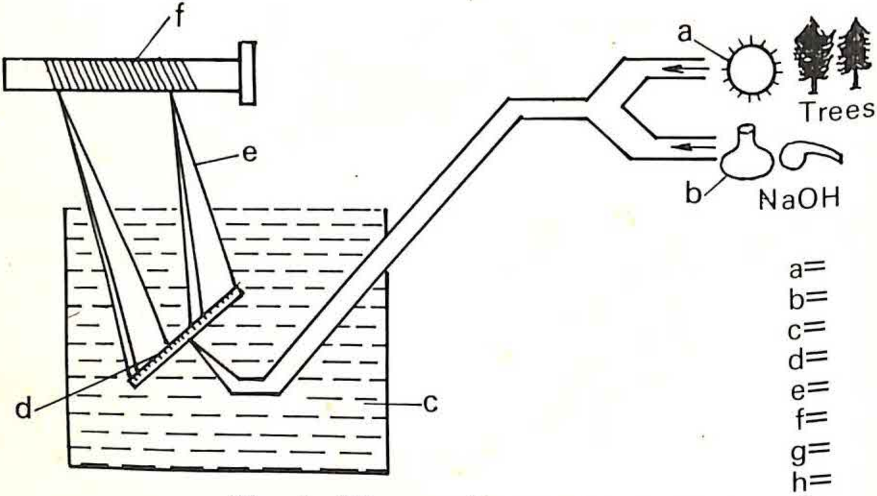
(ii) The inner ends of tracheal tubes contain haemocyanin *so that* _______.

(iii) *When* the front holes close, __________.

(iv) *While* the air passes through the tracheal tube, the fluid ______

C6. Read the following paragraph which describes the process of viscose rayon production and name the parts of the diagrams that follow:-

In 1905, Courtaulds started producing viscose rayons which were made by dissolving the cellulose obtained from wood pulp in strong caustic soda (sodium hydroxide) solution. Threads were formed by forcing the solution through a spinneret (a metal plate with tiny holes in it) which was in a setting bath of dilute sulphuric acid. The threads were wound out of the setting bath on to a reel, washed, dried on a heated reel and finally wound on to a bobbin. (ELT Document, special, The British Council)



a=
b=
c=
d=
e=
f=
g=
h=
i=

Fig. 1. Viscose Rayon Production

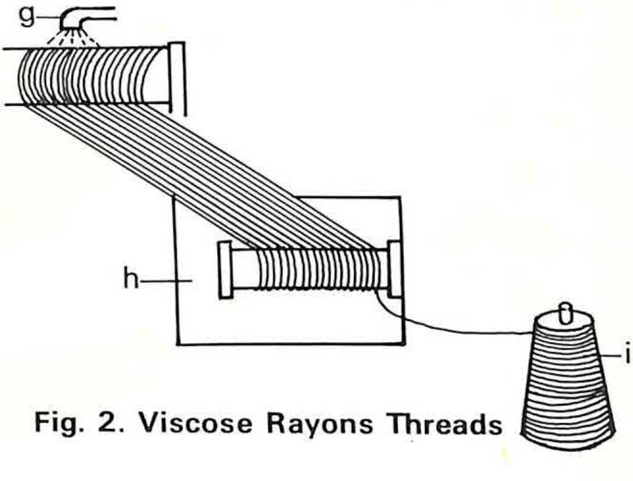


Fig. 2. Viscose Rayons Threads

Session D: *Integrated Grammar and Reading with Understanding*

D1. The following passage is a short form of the text, 'The Discovery of Penicillin' given under section A2. Every ninth word has been deleted and replaced with a blank. Four choices are given for each blank. Choose the most appropriate word for the blank.

THE DISCOVERY OF PENICILLIN

D2. Let us read how Alexander Fleming discovered Penicillin.

Before the discovery of Penicillin, carbolic acid was ________ 1 ______
(a, an, the, only)
antiseptic used by Lister to kill the germs. ________ 2 __________ was
(They , It, He, Its)
useful only for external application. Because if ________ 3 ________
(a, its, this, the)
carbolic acid is injected into the body, it __________ 4 ________
(would, will, must, may)
not only kill the germs but also the __________ 5 ____________; so
(body, white cells, cells,germs)
Alexander Fleming wanted to discover an antiseptic ______ 6 ________
(which , it , who, whom)

would kill only the germs and not the ________7__________
(body, white, red, leucocytes)
cells or the other cells of the human __________ 8 _______.
(body , blood, system, kind)
One day he took out one of his ____________9_________
(petri-dish, glass, experimental, culture)
plates and went near the window of his ________10_________.
(room, house, shelf, laboratory)
Just then a sudden gust of wind blew ________11_______
(to, for, from, in)
outside; Fleming saw something falling on the plate._____12________
(Then, When, Normally, Usually)
the plate would just be rejected and thrown_________13________.
(upon, away, in, outside)
But Fleming did not do so. He wanted_____14________ find out if the
(to, for, himself, him)
microbes were intact. He ____15______the plate under the microscope
(placed, kept, places, held)
and studied it._____16_____found that a mould had grown. He further
(It, They, She, He)
_______17___________that the staphylococci around the mould
(saw, observed, find, found)
were fast_______18_____ He understood that it had the power to
(disappearing, disappeared, disappear, dying)
______19____the microbes. Then he made a pure culture____20_____
(disappear, kill, affect, poisoned) (on, in, of, off)
the mould and tried its effect on other________21______________
(microbe, microbes, bacteria, virus)
He found that it inhibited the growth of_______22______________
(microbial, other, some, the)
bacteria. Thus he discovered penicillin. If Fleming had not been observant and inquisitive, he would have missed the opportunity to discover penicillin.

Session E: *Listening Comprehension and Conversation*

E1 Find the answers to the following questions by listening to the conversation that follows.

(i) What does the doctor do to diagnose Sundar's problems?
(ii) Why does the doctor want to give a test-dose to Sundar?

E2 The conversation takes place in a clinic between a patient and a doctor.

Sundar : Good morning Doctor, may I come in?
Doctor : Good morning, come in please.
Sundar : Thank you.
Doctor : What is your problem?
Sundar : Hmm. I have temperature for the last two or three days and I feel very weak.
Doctor : I see, let me take your temperature. Hmm. You are now running 102°, and there is acute congestion in the lungs also. Don't worry; a prick will set you right.
Sundar : Are you going to give me Penicillin?
Doctor : Yes, but only after a test-dose.
Sundar : Excuse me, sir. Why a test-dose?
Doctor : Well, you know some people are allergic to Penicillin; a heavy dose may prove fatal with them. A test-dose will indicate if you're allergic to it or not.
Sundar : I see. I didn't know that Penicillin was so bad for some people.
Doctor : Well, you have no reaction to the test-dose. Now let me give you the prick
Sundar : Thanks a lot, Doctor.
Doctor : Report to me tomorrow. Bye.
Sundar : Bye.

E3. Complete the following conversation. The scene:.the Laboratory and the topic of conversation: "The working of the Kipp's Apparatus".

Teacher : The Kipp's apparatus is used for preparing instant gases like H_2S, CO_2, etc.

Tamilmani : Excuse me sir, ______________?

Teacher : When you want the gas, just open the stop-cock; you will get the gas. When you close the stop-cock_______. Thus_____________________________________.
Hence I call it an apparatus for instant gas.

Tamilmani : I see like __________________________ __________ _______ this is an apparatus for instant gas. Sir, there are three bulbs one over the other. The bottom two bulbs form one unit and the top bulb is like a ______ _________________ funnel. But, sir_____?

Teacher : Well, you see, the reacting acid is at the top bulb. When you open the cock, the acid flows down to the bottom bulb and then the reaction will ensue ______. When you close the stop-cock the gas cannot escape from the middle bulb. So its downward pressure will increase and stop the acid__________.

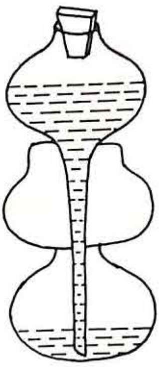
Tamilmani : Oh, I see, the apparatus works by decreasing or increasing the pressure in the bottom bulb.

Teacher : Yes, could you tell me ______?

Tamilmani : The opening and closing of the stop-cock decreases or increases the pressure.

Teacher : Good. See how a simple principle is used for a practical application in this apparatus.

E4 Name the parts of the apparatus and describe its working.



MODULE 4: NARRATING/DESCRIBING A PROCEDURE

Session A: *Surveying and Selective Reading*

A(i) The following narrative is taken from Nathaniel Southgate Shaler's Autobiography. He narrates how his teacher, Professor Agassiz taught him how to learn by himself to become a scientist.

(ii) **Surveying**

Survey the passage for forming a quick grasp of important names of persons, incidents and other information. For this, pass your eyes over the (a) Titles and sub-titles (if any), (b) diagrams/figures and their captions, and (c) glossary of terms, if any. While doing so, orient your thinking to the meaning which may underline these items and their relationships.

This procedure will be very useful when you read a long passage, and also when you want to make a selective reading of a book (vide module 10).

(iii) Certain items are given below; survey the passage amd write down in one or two sentences what you are able to make out of the passage.

(a) Title of the lesson (:likely theme?)
(b) Sub-titles (inter-relationships between them and likely incidents or development)
(c) proper names (write down the names)
(d) Important words (for which detailed explanations are provided) in the glossary.

(iv) **Scanning and Selective Reading**

Read the questions given under A4; then proceed as usual to (a) select a question, analyse the question and (b) read pertinent areas based on the sub-titles (if present) or scanning.

A-2. AGASSIZ MAKES ME A SCIENTIST

My Early Days

1. Agassiz's Laboratory was then in a small two-storeyed building. He had recently moved into it from a shed after the engineers had shifted to another site. Then I had joined as a research student to work under his guidance. When I sat down before my table, Agassiz brought me a small fish, placed it before me and asked me to study it. To my question, "What shall I do?", he said in effect, "Find out what you can without damaging the specimen. When I think you have done the work I will question you."

With No Guidance

2. The object was giving forth the stench of old alcohol. Many of the scales were loosened so that they fell off. When the professor came into the room again, I was looking at it and taking down notes. I was anxious to make a report and get on to the next stage of the business. But Agassiz, though always within call, did not concern himself with me that day, nor the next, nor for a week. I felt unhappy, but soon I saw that it was a game. I understood that my professor was covertly watching me. So I set myself to work again and from that day onwards I spent at least 3 or 4 hours upon the thing. During this period I got interested in finding out how the scales went in their series, their shape, the form and placement of the teeth, etc. After some days I felt I had learnt everything about it.

Learning by Doing

3. On the seventh day came the question, "Well ?" I told him whatever I had observed. After listening patiently he went away saying, "That is not right." Now I understood that he was forcing me to work on my own without the support of a teacher, and this stimulated me to work. I understood that there shoud be a number of things in the specimen which I should observe in greater detail and with greater care. So I decided to work on it at least for two months studying every detail with great attention. With this resolution I went to the task.

4. Soon I discovered a number of new things, but these did not satisfy him. He placed before me about half a peck of bones and asked me

to see what I could make of them. He did not give me any other instructions. I soon found that they were the skeletons of half a dozen fishes of different species. The task evidently was to fit the separate bones together in the proper order. I was soon set upon alcoholic specimen -- this time a remarkable lot of specimens representing perhaps 20 species of the side-swimmers, Pleuronectidae.

Becoming More Absorbed

5. I shall never forget the sense of power I felt in the beginning of the more detailed work on a group of animals. Thus I learnt the art of comparing objects; while at this stage I was allowed to read and to discuss my work with others, I did both eagerly and acquired a considerable knowledge of the literature of Ichthyology.

Discovering Agassiz's Greatness

6. I became interested in the system of classification. When I tried to follow Agassiz's scheme of division into the order of ctenoids and ganoids, I found that one of my species of side-swimmers had cycloid's scales on one side and a ctenoid's on the other. I felt I had discovered something which my professor had failed to notice. There was one fish which did not fall under any category in his system of classification. I went to him with a mischievous pleasure and asked him, "Sir, how should the nondescript be classified?" And he said, "My boy, there are now two of us who know that." I then realised he had made me discover what he had already discovered, and had given me the thrill of discovery. I understood the purpose of his method of teaching.

A Turning Point

7. This incident marked a turning point in my understanding of the subject, and my guide. After this, he became very communicative and treated me like a good old friend. Finding that I wished to devote myself to geology he set me to work on the Branchiopoda for they are the best group of fossils to serve as data for determining Palaeozoic horizons.

(Adapted from "The Autobiography"
of Nathaniel Southgate Shaler).

Glossary

Louis Agassiz was a well-known Professor of Natural History at Harvard. He founded the Museum of Comparative Zoology at Harvard. He is remembered for his pioneering work in classification.

N.S.Shaler : He became a famous paleontologist
Ctenoids : Fish with enamel-like substance over the scales
Ganoids : A sub-class of jawless fish
Cycloid : A sub-division of jelly-like fish

A3 Read paragraph 6 and answer the following questions:

(i) State what the following references mean in the given context:
    (a) 'I'in line 1
    (b) 'his'in line 6
    (c) 'us'in line 9

(ii) State what the following words/phrases mean in the given context:
    (a) 'one of my species'in line 3:
    (b) 'the nondescript' in line 8:

(iii) Rewrite the following sentences (beginning and end indicated)in your own words
    (a) (17) I went to him _____classified.
    (b) (18) And he said: My boy, ____that.''

A4 (i) Answer the following (local) questions:

(1) Who was Agassiz? What was his specialisation?
(2) Was Shaler devoted to his work in the beginning? What made him take a keen interest in his work?
(3) List the items which were set upon for Shaler's study.
(4) What did Shaler discover while using the classification system of Agassiz?

(ii) Answer the following (global)question:

What was Shaler's estimate of Agassiz (a) in the beginning and (b) in the end?

Session B: *Discourse Logic and Coherent Thinking: Contextual Association of Words and Pre-suppositions*

B1. Sets of statements/instructions are given below. Fill in the blanks with suitable words.

(i) (a) _____the mounted object between the light source and the object lens of the microscope and study the object.

(b) Add alum and ______ the water overnight in order to get all the hanging particles and soil sedimented.

(c) Add a small crystal and ______the supersaturated solution for a week to make the crystal grow in size.

(d) After using the reagent bottles _____them back in shelves.

(put, stand, place, keep)

(ii) (a) The professor _____that he would join the students for the village-stay programme.

(b) The professor ______the students that he would join them for the village-stay programme.

(c) The professor gave the students data-sheets and _______ them to use them for collecting data.

(d) The professor _____if all of us had received copies of the data sheets. (enquired, said, told, asked)

(iii) (a) The serum against snake bite is injected at the ____of the bite.

(b) Mud balls containing CCC may be placed in the root____of the plants.

(c) Systemic injections for the coconut trees may be given in any _______ near the bottom of the tree.

(d) Nematodes can be noticed in the root ____of the plants.

(part, place, site, zone)

B2. You will find below sets of statements with a few blanks. There is a meaning relationship (:or association) between the word italicized in one statement and the words (deleted and replaced with blanks in other statements). Find out the relationship between the words, and fill in the blanks with appropriate words.

(i) Agassiz placed before me a specimen and asked me to study it. It was giving forth the ______*of old alcohol* and many of the *scales* of the________had already fallen off.

(ii) I started observing every aspect of the *scales* of the fish, soon I found out how *they* went in _____series, their ____, the form and the placement of the teeth, etc.

(iii) It looked as if the teacher was not *watching me*; in truth he was ______watching my movement and work in the laboratory.

(iv) Shaler was required to study alcoholic ____, this time a remarkable lot of *specimens* representing perhaps twenty ____*of the side-swimming pleuronectidea.*

(v) He became interested in the system of _____ of fishes. When he followed *Agassiz's system* of division into the order of ctenoids and ganoids, he found that one of his specimens could not be put under any _____in the *system* of *classification* propounded ____.

B3. Sets of statements are given below. Answer the questions given under each set.

1. Agassiz's laboratory was then in a small two-storeyed building. He had recently moved into it from a shed after the engineers had shifted to another site.

   (a) Where was his laboratory before the shift?

2. Shaler understood that his professor was covertly watching him, so he set himself to work earnestly without moving from place to place.

   (a) What did Shaler expect his professor to do?

   (b) What made Shaler more attentive?

3. On the seventh day came the question 'well ?' and Shaler told him whatever he had learnt.

(a) Who put the question to Shaler?
(b) What did he mean by saying 'well'?

4. And Agassiz said, "My boy, there are now two of us who know that."
   (a) Whom does Agassiz mean by "two of us"?
   (b) Who of the two had made the discovery first?

B4. A few sets of statements are given below; portions of the statements are missing. Find out the missing portions (one or more words) by reading the available statements and restore them.

1. The *mind* branches out in all directions *like the roots of a tree.* It composes and _____. The roots _____whenever it comes across a problem or a stone in its way. *In the same way* the mind ______.
2. Certain physical shapes appear to be advantageous for winning sprint events. A fat person _______; *so* we are amused ______in sprint events.
3. Zatopeck was called the human locomotive *because* he _______. He won all the running events in the Moscow Olympics.
4. Certain antiseptics are poisonous both to the germs and the human tissues and cells. Although *carbolic acid* ______________. So it can be used only for external application. *If* carbolic acid is injected into the human body ________________.
5. *When* the abdomen of the cockroach contracts, the pairs of holes in the abdomen close and______________________ ____________________.______________________.The front holes and the hind holes act in opposite directions. *Thus* when the front holes open_______________.

B5. Words beginning with certain prefixes indicate certain 'features' in terms of its location or position relative to another 'known' feature. A few such prefixes are given below. Attempt to recall words beginning with these prefixes.

i) ana- (up)-	ii) epi- (on)-	iii) sur- (on)-	iv)dors- (upper)-
______	________	_____	________

v) ventr- (lower)- _____
ii) hypo- (under)- ______
vii) hyper- (over)- __________

B6. Description of a process or procedure involves indicating 'when' (after/before a point of time or another 'action'), a particular action took place (:past)/is taking place (present) to take place (future). Study the following statements in relation to pointers of time (italicized for your convenience) and fill in the blanks with suitable forms of words.

1. The small atoms *joined* into a little pair. *Then* a larger one ________(clasp) three or four of the little pairs, and thus a long row of large atoms ____ (combine) and little pairs of atoms finally ______(emerge). This dream gave me the clue for a linear structure of the molecule.

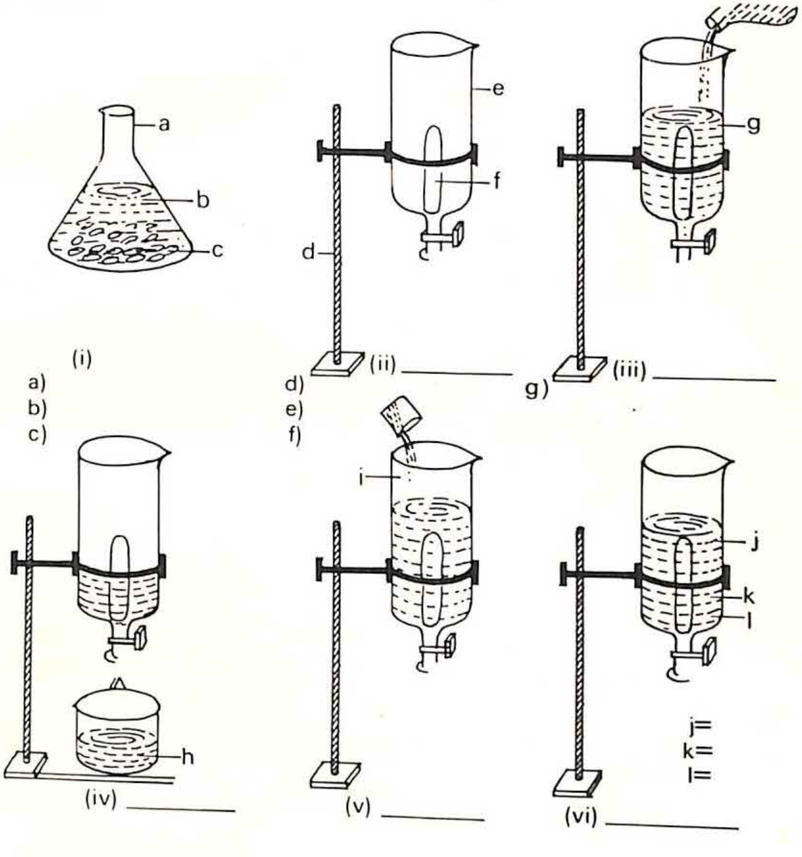
2. When you *observe* the mould through the microscope you ________(see) that it ______(grow) brush-like and the microbes round it ______(begin) to disappear. If you ______(prepare) a pure culture of the mould and ______(try) its effect on other bacteria you will _____(see) that the other bacteria also ________(get) killed.

3. Shaler understood that I ______(watch) his work in a discreet way. So he _____working with greater devotion. Soon he ________discovering many features in the specimen, which he ______(fail) to notice in the beginning. First he studied how the scales went in their series. Then he _______their shapes and finally the form and placement of the teeth.

Session-C: *Description of/Instruction for Experiment and Information Transfer*

In Technical Communication, the procedure for an experiment is either described or presented in the form of instruction. The discourse is so organised that the learner is able to clearly understand and follow the procedure properly.

C1. The following diagram describes a series of steps to be followed for "Extracting Chlorophyll-from green leaves or grass cuttings". Read the passage that follows the diagram and (i) give the names of the reagents used in each step, (ii) the names of products produced at the end of each step and (iii) appropriate title to each step.



C2. (i) The following passage sets out the procedure used in extracting 'chlorophyll-a' in the form of description (as in thesis writing); the procedure may be presented in the form of instruction also.

(ii) Before starting to read the passage, attempt to recall information/ words which you may know already on the topic. 'Extraction of Chlorophyll' (A few questions are given below for this pre-reading orientation). Also study the diagrams and attempt to identify apparatuses, objects and sequences of operations from the diagrams.

- (a) occurrence of chlorophyll
- (b) its function:
- (c) its properties: (like colour, specific gravity, solubility, etc.)

C3. Extraction of Chlorophyll-a

Chlorophyll-a was extracted from green grass cuttings without changing its composition by the following method.

Reagents used:

- (1) 80% acetone (20% water) mixture
- (2) petrol ether
- (3) calcium carbonate column (chalk piece)
- (4) grass cuttings

Procedure

1. A handful of chopped and dried grass cuttings were placed in a flask.
2. A mixture of 80% acetone and 20% water was poured into the flask and shaken well until the colour had passed into the mixture.
3. A fresh piece of blackboard chalk was placed standing upright in a filter funnel.
4. The extract was transferred to the filter funnel with the chalk.
5. When the green extract turned red, the extract was drained carefully without disturbing the column of chalk.
6. Then, petrol ether was poured on to the column of chalk slowly.
7. Owing to the different adsorbabilities, the pigments separated from one another with the Xanthaphylls furthest down, chlorophyll near the top and chlorophyll-a in the middle.

C4. Statements of 'actions' may be given in the form of instructions/ directions or descriptions (of action in the past/present time). Generally experiments are reported in a descriptive form in 'thesis' as in the passage presented above. Study the following illustrations, and accordingly rewrite the above passage in the form of instructions.

e.g.	**Description**	**Directions/Instructions**
1.	Grass cuttings *are placed* in a flask.	*Place* the grass cuttings in a flask
2.	Petrol ether *is poured* on to the column of chalk.	*Pour* the petrol ether on to the column of chalk.

C5 Transfer the following non-verbal description into a verbal descriptive form (specifying the actions and the order in which to carry them out).

Crop-care in the First Month

Field with ------> Weeding ----> Hoeing----> irrigating : once if wet
the crop (twice/thrice) (twice/thrice) : Twice if not wet
Spray Dethis <----- Apply : At 20kg
carbaryl N twice.

C6. Rewrite the following passage in the form of 'instruction':

Any bright and clean iron surface like a clean nail, a key is dipped into the Bordeaux mixture for one full minute. If any brown colour appears lime solution is added until no brown deposit appears on the surface. With this step it is ensured that the Bordeaux mixture is safe for application. Otherwise the mixture prepared by you will be acidic in nature, and hence may affect the plants.

Session D: *Integrated Grammar and Learning to read with expectancies*

The following passage is a version of the text you studied in session A. Read the passage and fill in the blanks from among the given choices. After completing the whole passage, read again to check if the meaning is alright. Try to complete the task in 15 minutes.

MY EXPERIMENT WITH SHALER

When Shaler joined me as a research fellow he looked very smart. But he appeared to take things easy and was not disposed to working on his own. However, I found him to be intelligent. So___1__(He, I, Shaler, Agassiz) felt that if he is given a___2___(simple, useful, dull, stimulating) environment he would become more earnest and___3___(devoted, hard-work, hard-working, sincere). I have always believed that motivation to____4____(regular, lab, hard, less) work should come from within. It could____5___(well, not, ever, never) be taught. My aim was only to ____6___(ask, making, tell, help) him become more involved in his work____7____(So, Though, However, Because) I gave him materials for study and____8____(left, explain, explained, leave) him and the materials to himself. I___9____(left, leave, gave, allow)him a lot of time to study____10____(for, of, the, well) materials and to report to me, and____11___(he, Agassiz, me, I) did not give him any instructions as___12____(if, soon, well, to) what he should observe and what he____13_____(should, might, may, to report).

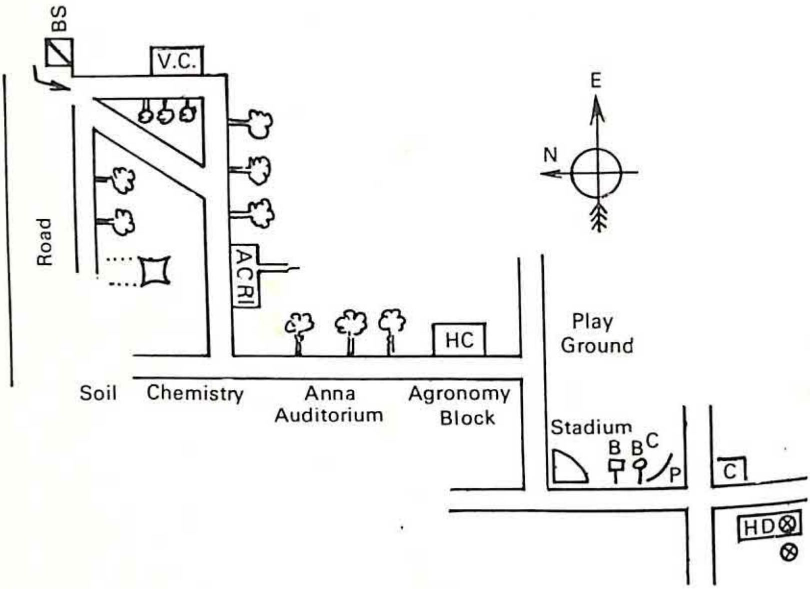
First I gave Shaler just a____14____(swimming, small, specimen, shorter) fish and asked him to study it___15___(not, with, for, without) damaging the specimen. After two or three____16___(fish, weeks, fishes, times) I placed before him half a peck___17___(of, and, on, or) bones asking him to study with greater____18___(observation, interest, devotion, attention) all the finer details observable in the___19___(bone, gave, given, experimental) samples. After about three months, I gave ___20___(him, Shaler, samples, later) a number of alcoholic specimens and asked___21___ (me, Shaler, him, Agassiz) to compare the features of the____22____(species, specimens, fish, classes) with one another. Whenever he came to____23____(Agassiz, me, mine, him) to report, I would listen to him____24___(hurriedly, carefully, careful, patiently) and finally ask him to come out____25___(of, with, for, to) more detailed observations. However, whenever he___26___(came, completed, finished, returned) after further studies I would compliment him____27___(on, for, with, to) his perseverance and his obsvervations as well___28___(Although, Thus, If, Because) I trained him in the skills of___29___(learning, understanding, studying, reading) to learn and persevering with the problem___30____(in, with, on, at) hand until everything about it was learnt___31___(For, After, Later, Before) this I gave him the task of___32____(observing, comparison, comparing, reading) objects using my system of classification. I ___33___(knew, found, felt, know) that my system of classification had a ___ 34 ____ mistake, flaw, category, misfit) a particular fish could not be put ___ 35 ___ (in, up, to, under) any category in the system I have advocated. I wanted to find out if Shaler was capable of discovering this flaw. Well, he did it; my method of training him has proved its worth.

Session E: *Oral Skills : Seeking and Giving Directions*

E1. Read the following conversation between Shaler and his teacher 'Agassiz' and complete it with suitable statements:

Shaler : Excuse me, Mr. Agassiz, I would like to get a clarification from you about my work. Would you kindly give me an appointment.
Agassiz : ______________ Will that suit you?
Shaler : Yes Sir, thank you.
Agassiz : Okay______?
Shaler : Yes Sir, it is. I have understood your system of classifica tion. However, I find it difficult to classify all the specimens as per your system.
Agassiz : Oh, I see. Have you come across any specimen____?
Shaler : Yes, I have a fish which does not fit with any of your descriptions.
Agassiz : Great; Do you refer to the one_____?
Shaler : Surely, Sir, I thought I have stumbled upon a new thing.
Agassiz : Well,____________
Shaler : Thank you so much, Sir.

E2. Imagine that two of you are standing at the University bus stop. Someone gets down from the bus and asks you the way to the hostel office. Imagine that 'A' gives 'instruction' as to what the person should do to reach the place and 'B', what the land marks are. See the illustration and complete in five exchanges.

BS
V.C.
Road
ACRI
HC
E
N
Play Ground
Soil
Chemistry
Anna Auditorium
Agronomy Block
Stadium
B
B
C
P
C
HD

'A' : Proceed along keeping to the road on your right, until you pass by the red building with the clock-tower.

'B' : That building is known as the A.C.R.I. main building. The building faces the North and you must keep moving westward until you reach redbrick buildings.

'A' :
'B' :
'A' :
'B' :
'A' :
'B' :
'A' :
'B' :

MODULE-5: DESCRIPTION OF PROPERTIES AND USES

Session A : *Setting up Reading Expectations for Perceptive Reading*

A1.(i) The following passage is taken from "Weekend Telegraph"; it describes one or two practical experiments on 'dominant' character. To become a great scientist one should have a dominant will.

(ii) Pre-reading Orientation

The title of the passage is "A Rat in 20 is a leader". Attempt to understand the words and their relationships in the given title in terms of (a) What you may know on the words in the title and (b) What the content of the passage is likely to be. For your guidance, the words and phrases in the title are given below. Attempt to fill in the blanks with suitable words/statements.

	Forms	Social	:Qualities:	Personal
(a) 1. Rat	_____	_____		_____
2. Leader	_____	_____		_____

(b) 1. A Rat in 20 (i)_____
(ii)_____

2. A Rat in 20 (i)_____
is a Leader (ii)_____

(iii) Setting up Reading Expectations

Perceptive reading takes place when the reader sets up 'reading expectations': (what one may expect to learn from the passage) and relate them with the purpose of the writer, and the treatment of the subject/topic. Set up reading expectations by following the procedure given below:

1. Understand the questions (if given)- (vide A4) and the underlying pre-suppositions,
2. Understand the general theme/purpose of the passage through surveying and selective reading, and
3. Relate the knowledge gained by steps 1 & 2 above with your pre-reading orientations and set up your Reading aim (expectations) in the form of questions.

(iv) A few questions are listed below for a model of reading expectation. This is how you should set up your aims for reading the passage.
   - (a) Does one acquire leadership qualities? or, are these in-born?
   - (b) Can every dominant person become a leader?
   - (c) What is the relationship between education and leadership qualities?

ONE RAT IN 20 IS A LEADER

A Chinese Secret

1. One of the most closely guarded secrets of the Korean War is why there was no escape of American prisoners. The Chinese wanted to economise on manpower. So instead of keeping all the prisoners under heavy guard, they watched them for a day or two and picked out all the 'Leader' figures: anyone who seemed to have imagination or enterprise. These were men of will. They were isolated and guarded heavily. These leaders were kept under lock and key; the rest were left free and unguarded. No one tried to escape because there was no leader to urge and guide them. They appeared to have no 'will' of their own.

2. The 'dominant' types, the Chinese found, were always precisely five percent of the total number of soldiers. The same figure also applies to animals. In experiments concerned with the effect of overcrowding among rats, Dr. John B. Calhoun of the USNIMH discovered that the dominant rats numbered five per cent of the total. Which class did the rest belong to? To the submissive one.

Experiment on Rats

3. Forty rats were put into four cages, all interconnected. There was enough room for all the rats to be fairly comfortable. But two of the rats were very dominant; indeed, 'king rats'. Each one of them took a cage for himself, and established himself in it with his queen. The rest had to crowd into; the remaining cages creating a kind of slum. They did not go within the range of the 'king rats'.

4. Then an interesting thing happened. The remaining less dominant rats did not actively challenge the authority of 'king rats'. Instead they formed themselves into criminal gangs; they did not stay in one place but went round attacking the other rats, stealing food and generally creating nuisance. Rats normally respect social rights and have an extremely elaborate courting ritual which is never violated under normal conditions. The criminal gangs abandoned it and went in for rape. A percentage of them became homosexuals.

Activities for the Dominant Ones

5. The point I am making should be ominously clear. Every society has to provide a safe outlet for the activities of its dominant five per cent; otherwise they may become anti-social. A hundred years ago, a boy of this sort might run away to look for gold in 'Alaska'. There were many such outlets for the urge to be adventurous. These adventurous ones became great explorers, discoverers, soldiers. In our times, one can become great astronauts or scientists or leaders of great movements. However, in order that the dominant ones of our times do it, we should involve them in the experiments of modern science. If we fail to do it these men, like rats, will become unsocial and anti-social. The society will then not only lose their potential service but suffer from their criminal activities too.

Education and Dominance

6. Man may resemble a rat; yet, he is different in some important respects. He can be educated to grow beyond the range of instincts and to evolve into a higher being; but the rats cannot be. By means of liberal education, the genotype of every man can be nurtured and

made to blossom into an endearing phenotype. And here lies the worth of a sound system of education; its worth as a great means to a worthy end. Then the dominant ones in a society will work within the framework of the society and contribute to its progress.

A2 (ii) **Glossary of Terms**

Enterprise : an urge to do new things
Liberal education : Science and Arts
Genotype : potential abilities
Phenotype : realized abilities

A3. Read paragraph 4 and answer the following questions:

(i) State what the following referents mean in the given context:
(a) 'They' in line 3
(b) 'It' in line 7
(c) 'Them' in line 8

(ii) State what the following words/phrases mean in the given context.
(a) challenge (12), (b) normal (17)

(iii) Rewrite the following sentence in your own words
(15-7) Rats normally____normal conditions.

A4. Answer the following (local) questions:

(i) (1) Describe the evidence to conclude that without leader figures a society will not make any progress.
(2) What, according to the Chinese, are the qualities of a leader?
(3) Describe why our scientists should be given liberal education.
(4) Describe the social customs of the rats.
(5) Describe the evidence to conclude that the leader-figures turn into anti-social elements. What is the solution?

(ii) Answer the (global/perceptive) questions you have set up under 'Reading expectations' [vide A1 (iv)]

Session B: *Discourse Logic: Identifying generalizations and Evidence Use*

B1. Sets of sentences are given as follows. Fill in the blanks in each set appropriately from among the words given in brackets.

1. (a) The plants lodge___they grow very tall.
   (b) The plants lodge___their tall growth.
   (c) ___the plants are likely to lodge they cannot be raised in windy places.
   (since, because, because of)

2. (a) The other rats did not challenge the authority of the 'king rats'____they formed themselves into criminal gangs.
   (b) ____ using 80 % Acetone mixture, the experimenter used ethyl alcohol for the extraction of the chlorophyll.
   (c) The yield potential of I.R.50___ that of ADT 27 has been found to be very high.
   (instead of, as against, instead)

3. (a) ___ the number of sprayings of insecticide had been reduced from 12 to 7 the yield of cotton was not affected.
   (b) ___ the number of sprayings of insecticide is reduced from 12 to 7, there will be no reduction in yield.
   (c) ___ the number of sprayings of insecticide had been reduced from 12 to 7 we would have saved about 40% of our expenses without any reduction in yield.
   (d) _____ the reduction in the number of sprayings, the yield remained the same.
   (Even if, Even when, If, In spite of)

4. (a) These crops___one another in their response to variations in Sunlight.
   (b) The two crops___each other only in the duration of maturity; in other respects they behave alike.
   (c) The teaching system followed in TNAU is____the system followed in other colleges.
   (different from, differ from, differ with)

5. (a) ___ the varieties tested for saline tolerance , CO. 42 appears promising.
   (b) ____ the two varieties tested for saline tolerance. CO. 47 is found better than CO. 42.
   (c) CO. 47 rice has been selected for recommendation for problem soils _____ a number of varieties tested for saline tolerance.

   (between, among, from among)

B2. The following lists of context-related expressions have one or two unrelated words. Identify these odd expressions.

e.g. pop music, rock and roll, guitar, drum, *Nadaswaram*, dance.

(1) Oxidation, substitution, reduction, replication, division, multiplication, summation.
(2) Leaf area, leaf edge, chlorophyll, air hole, diffusion, respiration, oxygen, carbon dioxide.
(3) Ectoform, mesoform, endoform, chloroform, endoderm, dermis, muscle.
(4) Petridish, seedlings, controlled temperature, transplantation, morning, two for each hill.

B3. A few 'topics' are given below. State as many words as you may recall, which may co-occur in the given topic-context.

(i) Respiration system
(ii) Travel by a town bus
(iii) Tea

B4 Read the following statements and fill in the blanks with suitable expressions. Remember to look for meaning relationship between words in terms of the contexts described/narrated.

(1) The Chinese picked up the leader figures from among the arrested soldiers and put them in prisons; the rest were not____; they were left free and____.

(2) The leader-figures are men of will. They have imagination and enterprise. The others have neither___nor______.

(3) The mind branches out in all directions like the tree spreading out for...And like the roots of a tree____,the mind also branches out only when there is a need to______.

(4) Endomorphs are at a great_____in athletic events like the running events and jump events. While the mesomorphs enjoy a great advantage______weightlifting and boxing the ectomorphs_____ in sprinting events and jump events.

(5) The aim of a doctor should be not.....much to kill the germs with an outside agent as to____the white cells in the blood-system to_____the germs.

B5. A series of statements (generalisations) are given below. Expand them with suitable illustrations.

1. There are certain solvents which are useful as reagents also. For example,______.

2. Kekule said:, "Let us learn to dream, gentlemen, then perhaps we may find solutions to some of the unsolved problems in chemistry". For instance,_____

3. A fat man is not likely to be a successful wrestler. However, there are exceptions. King Kong_____but_____

4. Sometimes accidental occurrences lead to great discoveries in the field of science. It was an accident which_____lysozyme, the first natural_____It was by another accident that the antibiotic Penicillin___________.

5. Perseverance and hard work are necessary for a scientist. Only these qualities sustain the scientists and help them with new findings. In the beginning, Shaler_______ but later, he _______

B6. A few statements are given below. Complete the statements using the 'given' information (generalisation/illustration/use).

(i) The 'dominant' types, the Chinese found, were precisely five per cent of the total number of soldiers in a group. The same figure also applies to animals. In experiments using rats, Dr. John B. Calhown discovered that ________.

(ii) The rats normally do not attack other rats; they do not steal food; they do not commit social nuisance under normal conditions ; under abnormal conditions the rats _____. This is true for human kind also. They _______.

(iii) Shaler felt he had discovered a flaw which Agassiz had failed to notice . When Shaler attempted to categorise the fish under the system of classification of Agassiz, he found that ______ the fish had cycloid ' s scales on one side and Ctenoid's ______.

(iv) Fleming found that the microbes around the Penicilium mould were fast disappearing. So he concluded that ___.

(v) Kekule knew that all the'H' atoms in Benzene could be replaced by 'OH' or 'Cl' one after another. So he thought that the 'H' in the ring structure of Benzene ________.

(vi) Carbolic acid was found to be a good antiseptic. Lister applied carbolic acid on the wound of one rat, and injected it into another wounded rat. The former became alright; the___died. The experiment, thus, proved that _____ If injected into the body system carbolic acid _____.

Session C: *Description of properties/requirements and uses and Information Transfer*

In Technical Communication, properties of chemical/plants, etc. are generally described in the form of direct statements. Sometimes there may be only statements of the uses of chemicals/plants without any reference to their properties; in these places the reader is required to infer the properties of materials from the statements of the uses.

C1. Read the following table and infer the properties of the materials from the given contexts of their uses. Write down your inferences in one or two statements.

Table 1 : **Properties and Uses of Materials**

No.	Context	Material used	Properties/Qualities
1	Building Railway Bridges	Steel	
2	Electrical insulation for HT cables	Bakelite	
3	Handles to saucepans	Wood	
4	Acid containers	Glass	
5	Extraction of Chlorophyll	80% Acetone	

C2. The following passage describes 'The Properties of Chlorophyll' in an indirect form. Before starting to read the passage, recall information you may already know about chlorophyll (Module 4). Classified headings are given for your convenience.

Chlorophyll a) Physical properties ______

b) Chemical properties ______

C3. Complete the following equations and the Table based on the passage given below:

(i) Green leaves +80% Acetone Water-------> __a?__+_____ b? ___

(ii) The solution in petrol ether---------> d? + e? + f? + g?

(iii) Green leaves + Ethyl Alcohol-------------> h?
(C2 H5 OH) (Boiling)

(iv) Table 2: **A Comparative Study of the Properties of Chemicals.**

No. Properties & Structure	Chlorophyll -a -b	Carotin	Xanthophylls	Haemoglobin
1. Colour				
2. Structure				
3. Unique feature				
4. Soluble in				
5. Absorable in				

C4. The properties of Chlorophyll

Chlorophyll can be extracted from leaves without changing its composition, by mixture of 80 per cent acetone and water and can afterwards be separated from various impurities by transferring it to petrol ether. It forms a rich green solution with a blood-red fluorescence. It is not a pure substance, but has been shown to be a mixture of pigments, chlorophyll-a and chlorophyll-b, which are always accompanied by carotin and xanthophylls. The chlorophylls give a green solution with a strong blood-red fluorescence, the carotin is orange-red and the Xanthophylls yellow.

They may be separated on a carefully prepared column of calcium carbonate or cellulose. When a mixed solution is poured on to the column, the solvent runs through taking the carotine with it and leaving the other pigments adsorbed upon the carbonate. If the column is then developed by pouring through petrol ether, the remaining pigments separate from one another owing to their different adsorbabilities, with the xanthophylls farthest down, chlorophyll-a in the middle.

The chlorophylls can be completely extracted from leaves by boiling them with ethyl alcohol; but they are esterified by the hot alcohol to ethyl chlorophyllides. Chlorophyll-a and-b are closely related in their molecular structures which are built upon a complex prophyrin ring similar to that of the blood pigment haemoglobin; but whereas the heam contains an atom of iron the chlorophylls contain an atom of magnesium. Joined to the porphyrin ring there is a long phytyl side-chain which is soluble in lipids. Carotins are long chain hydrocarbons and xanthophylls are similar but contain a little oxygen in OH groups attached to their hydrocarbon chains.

C5. A description of the properties of an object, sometimes, may include statements of similarities and dissimilarities between the objects belonging to the same class.

Study the following statements which describe similarities and dissimilarities. Complete the statements suitably; you may refer to the passage given above.

1. (i) Chlorophylls-a and - b are closely related in their molecular structures which are built upon a complex porphyrin ring similar ____________
   (ii) *but whereas* the haemoglobin contains an atom of iron, the chlorophylls contain ____________
2. (i) Chlorophylls-a and-b, xanthophylls and carotins all dissolve in acetone.
   (ii) They are absorbed by calcium carbonate
   (iii) but ____________

3. (i) Chlorophylls have a complex ring structure.
   (ii) *While* the other ____________
4. (i) Carotins and Xanthophylls are both chain hydrocarbons;
   (ii) *However*, Xanthophylls. ____________

C6. Study the following statements and note that the statements occur one after another in a particular order

e.g (a)Chlorophyll has to be extracted from leaves. (Requirement)
(b) Chlorophyll dissolves in 80% acetone and 20% water. (Property)

(c) So, it can be extracted from leaves *by a mixture of 80% acetone and 20% water*. (Means)

OR

So, a mixture of 80% acetone and 20% water can be used to extract chlorophyll from leaves. (Use)

Following the above example, rearrange the order of the following statements so as to make sense.

1. (a) Chlorophyll dissolves in ethyl alcohol on boiling.
   (b) Chlorophyll has to be extracted from green leaves.
   (c) It may be extracted by boiling it with ethyl alcohol.

2. (a) The source of potential energy is found in the chemical energy of food.
   (b) All organisms must work to live.
   (c) They, therefore, require a source of potential energy which can be utilised to do work.

3. (a) Copper has many electrons in its outer orbit.
   (b) Good conductors of electricity are made of copper.
   (c) Substances with free electrons in their outer orbit can be good conductors of electricity.

Session D: *Integrated Grammar and Reading with expectancies.*

The following 'cloze' text is another version of the text given in Session A. Read the passage and fill in the blanks appropriately. For your convenience the first letter and the number of letters in the words are given elsewhere. First write down your answers, check up with the given clues and then finalise your choice of word for each blank.

D1. **One Rat in 20 is a Leader**

Some are born with a dominant will. These persons have imagination and enterprise to do new things and so___1____generally possess leadership qualities. Every society owes___2___progress to these leaders. If there are___3___leaders, the society will then have no ____4___enterprises for growth. But the questions are:___5___there natural leaders? If yes, how many____6____likely to be leaders in a given _____7_____?

The Chinese, by practical observation, found out ____8____there are 'natural' leaders and that five___9___of a given group will be naturally___ 10____ John B. Calhoun carried out an experiment with 40 ____ 11 ____ and found that one in 20 was ____12___leader. Thus he also arrived at the ____13___conclusion. That is five per cent of a ____ 14____group has dominant will and possess leadership___15___.

Now the questions are: Won't these leaders ____16___selfish or selfless? And won't they not____17____leaders of criminal gangs indulging in anti-social___18___? The experiment of John B. Calhoun clearly proves that___19___leaders may become selfish, and may also ___20____leadership for criminal activities.

What then should___21___society do to channelise the leadership qualities ____22____desirable ways? The answer is: Make the ___ 23 ____system more challenging and enterprising; engage the___24___in _____25_____the tribals, space experiment and vocational adventurous activities like mountain-climbing, social work experience;____ 26 ____the science students to the importance of_____27____and Humanaties, and the students of Arts_____28____the applications of Science to human welfare____29____we do these, the society will be ____ 30 ____to generate leaders of the desirable kind. Then the leaders will be leaders of human progress and welfare, and not exploiters.

D2. After you have made your choice for each blank, check your choice with the following ones:

1. t(4), 2. i(3), 3. n(2), 4. n(3), 5. A(3), 6. a(3), 7. g(5), 8. t(4), 9. p(7), 10. d(8), 11. r(4), 12. a(1), 13. s(4), 14. n(7), 15. q(9), 16. b(2), 17. b(6), 18: a(4) 19. t(5), 20. p(7), 21. t(3), 22. a(5), 23. e(11), 24. s(8), 25. a(5), 26. e(6), 27. a(4), 28. t(2), 29. I(2), 30. a(4).

Session E: *Listening and Oral Skills: Dialogues for Practice*

A few dialogues are given below; you will notice that certain syllables are uttered with greater force. Listen to the dialogues and (i) identify forms of exchanges: introduction, agreement, disagreement, etc., (ii) syllables which are uttered with a great force at the level of (a) words (marked with capital form) and (b) sentences (marked by italicizing). Complete the missing portions suitably.

E1. Formal Greetings

Sunder : Hello. How are you?
Ram : Fine. Thank you_____
Sunder : Fine. Where are you Going?
Ram : To the Library.
Sunder : Oh fine_____
Ram : See you.

E2. Formal introduction In the Library

Murugan : Mr. Ram. I'd Like you to meet Mr. *Gopal*
R : How do you do?
G : ________________
M : Mr. Gopal is an Economist. He's just submitted his Thesis for his Ph.D.
Ram : Oh? That's my Field too. I'm also_______
G : Working for Ph.D., by any chance?
R : Yes,______________?
G : I think I've read your Articles in the M.A.S.U. Journal. They are Excellent.
R : _________Well, Gopal, could you spare some time? I've a Subject to discuss.
G : _______; in the Evening if you don't mind.
R : Fine, I'll wait for you. Murugu, Can you come along with him_______.
G : Oh! Yes.
M : Bye bye.
R : Bye, bye.

3. A Telephone Conversation (formal/informal)

Lib : Hello_____ Speaking.
Murugu : _________May I speak to Ram.

Lib : Just a Minute. Ram,________.
R : Hello.
Murugu : Hi Ram. This is Murugu. Our Grades have come ! You've scored 'A'.
Ram : ___________ What's Yours?
Murugu : Well, I am also 'A'.
R : Congratulations. Don't you like to celebrate it?
M : ________, shall we Go to a Movie tonight?
R : Fine. The Movie starts at 6.30._________?
M : We'll take Him also. Will you be Ready by six?
R : Fine________ (Phone clicks down)

4. Moods

Arun : You look very happy, Mr. Ram.
R : ________I just heard, I've scored 'A' in my exams.
Arun : ______ ! I'm Glad somebody's Happy.
R : Why? What's the matter?
Arun : Oh,_______, I have to take a Bio-Chemistry examination this afternoon.

5. A Piece of Advice

R : Oh, Dear, Dear: I know what's Wrong with you. You don't sit up and study.
Arun : ________. I'm not able to Concentrate But. then__I rather think it's pretty________
R : It's not so hard if you stick to a routine. For instance, you make it a point not to move out of your room from 8.00 to 9.00 p.m.
Arun : _______ ! Let this Test be Over; I'll try _______
R : *Fine*. I'm sure you'll *see* the Difference.
Arun : Well. What time is it now?
R : It's Quarter to One.
Arun : Oh! I should be in the Classroom by ten to one ____ Bye.
R : _______________

MODULE-6: DESCRIBING SIMILARITIES AND DISSIMILARITIES

Session A: *Reciting and Summarising for Reviewing*

1.(i)The following passage has been adapted from 'Scientists Behind the Inventors' (Avon Book Division, NY). It describes how James Watt attempted to solve a problem in a pump, and how in the process he developed the Steam Engine. Students of science should acquire the ability to (a) compare objects and their functions, (b) identify problems and (c) synthesise a new approach to solve them. This ability is basic to innovative and problem-solving work in science.

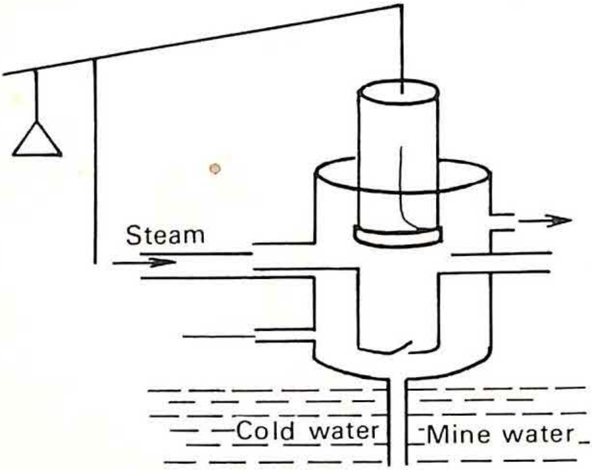
(ii) **Pre-reading Orientation**

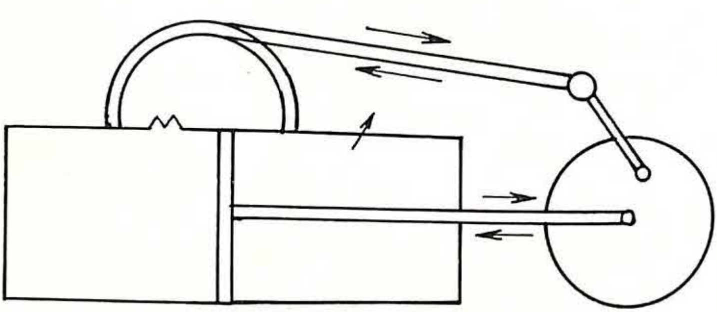
The title of the passage is: How James Watt invented the Steam Engine. Recall expressions associated with the 'water pump', and the 'steam engine' which you may have studied in your high school course. If possible, visualise their form and parts.

(A) Water Pump:Key expressions used to describe
  (a) its parts ________________
  (b) their functions/uses______________
  (c) operational problems, if any ____________

(B) Steam Engine: Key expressions used to describe
  (a) its parts______________
  (b) their functions/use______________
  (c) the operational advantages over the water pumps _

For your convenience, simple diagrams of the Newcomen Engine and the Steam Engine are given on page ____ Name the parts, if you can. If not, you may do so after reading the passage.





(iii) Setting up Reading Expectations

When there are no post-reading questions you may set up your reading expections by (a) surveying and reading selectively and (b) relating this (:a) with your pre-reading orientations on the subject/ topic. List them in the form of questions.

(a)____________________
(b)____________________
(c)____________________

Compare your questions with those given under A4 (i)

(iv) **Reciting Significant Information**

You must attempt to read carefully such areas where the information (: like generalisations, illustrations, evidence, etc.) appear to be relevant to your 'Reading Expectations' (identifying significant information). Reciting is selective recalling of significant information from the given passage. You may do this after reading each paragraph or a passage by raising a few 'wh-' questions (beginning with words like what, when, where, why).

For this passage, questions are given at the end of each paragraph (: a self-contained thought unit) or paragraphs under one heading or sub-heading so that you may learn how to recite significant information.

(v) **Summarising for Reviewing**

Summarising a technical passage is done generally for interpretation; reviewing is not a mere reproduction of information. When you list cogently the answers you get for each one of the questions (set up as your 'Reading expectation') you get the gist or summary suitable for reviewing and interpretation.

(1) Recall significant information gathered from the passage.
(2) Compare /contrast these information with your experience and 'Reading Expectation'.

(Estimating which information is new, how it could be applied, etc., and evaluating their worth are matters relating to reviewing and interpretation. You will learn how to read for reviewing in the next module)

(vi) Read the passage and find the answers for the questions given under A4

(Answers to these questions will form the technical summary suitable for reviewing).

HOW JAMES WATT INVENTED THE STEAM ENGINE

A2. The Newcomen Engine

(i) Young James Watt, a mechanic, stood in his workshop looking into the parts of the Newcomen engine which he had to repair. It was an atmospheric engine. Its job was to pump the water out of the deeper mines. James Watt was asked to find out how the machine could be made to work using less coal. Coal was used to produce steam; actually it used more coal than it helped to mine.

(a) What is the moving force for the working of the engine?
(b) Why was coal used?
(c) What is the 'problem' to be solved?

It was not a steam engine; steam was used merely to create a vacuum so that atmospheric pressure could act as a moving force. There was a cylinder, a piston and a weighted beam to pull back the piston. Steam was shot into the cylinder below the piston. Then cold water was shot into the steam to condense it into water. When the steam had been turned into water, a vacuum was felt in the column below the piston, and the pressure of the atmosphere above the piston forced the piston into it. Then a weighted beam would pull the piston back and steam would be shot again into the cylinder to create a vacuum. Thus the whole operation was repeated. Steam was not used directly to push the piston forward or backward.

(a) What was the function of steam?
(b) What made the piston move downward and upward?
(c) What was the mechanism used to generate steam for the engine?

Observing A Phenomenon

(2) What puzzled Watt was the immense amount of water that had to be injected into the steam to cool and liquefy it. When water was first shot into the cylinder, instead of liquefying the steam, it turned into steam itself. Further, the steam registered 212° F, which was also the boiling point of water. He could not understand how two states of one and the same matter, steam and boiling water, could have the

same temperature.This appeared to be mysterious, and James Watt was determined to find out the principle behind it.

(a) Why was so much water used ?

(b) What aspect of the 'steam' and the 'water' puzzled Watt ?

(c) What did Watt want to find out ?

Setting up An Experiment

(3) He attached a tube to the sprout of a tea kettle. He put the other end of the tube into a glass containing water at room temperature. He expected the steam to be condensed as it entered the cool water. To his surprise, the cool water began to boil. The steam had made the water boil. He pursued the experiment and found out that the steam could gradually heat six times its own weight of cool water to the boiling point. Further the thermometer had never risen above 212°F throughout the experiment. From where did the extra heat come to boil the cool water? Why did the thermometer fail to register the concealed heat present in the steam? This appeared to be a big problem for him.

(a) What did he discover about the property of steam?

(b) How can the heat property of steam be put to use?

Consulting Dr. Black

(4) He took this problem to Dr. Joseph Black who was then the Professor of Anatomy and Chemistry in Glasgow University in 1750. At that time heat was considered to be a substance called 'Phlogiston'and Oxygen had not been discovered. Black told him this: in the presence of a cold object the particles of steam could not keep their tendency to avoid each other, and so formed into drops of water (Now we explain that heat is converted into energy and thus becomes latent). Thus much steam was wasted during change of state and the whole process was extremely slow. The explanation cleared up the mystery as to why the extra heat in the steam was not visible. But the problem that remained was: how to use this new knowledge and correct the defect in the Newcomen engine?

(a) What was Heat thought of at that time?

(b) Is there any loss of energy during conversion from one state to another?

(c) How can steam be used without loss of energy?

(5) Watt became so restless that he began to spend many sleepless nights searching for a solution. He wondered if he could have the steam pipe elsewhere. He asked himself if he could not make it work with steam power itself. But as often happens the harder he worked over it, the more remote the solution seemed to become. Thus he raked his mind looking for some clues to the solution. Suddenly one Sunday afternoon, a new idea flashed across his mind. ''It was in the Green of Glasgow. I was thinking upon the engine at the time and had gone as far as the Herd's house when the idea came into my mind, that as steam was an elastic body it would rush into a vacuum and if a communication was made between the cylinder and an exhausted vessel, it would rush into it and might be there condensed without cooling the cylinder ______ I had not walked farther than the golf-house when the whole thing was arranged in my mind''.

(a) What property of the steam did Watt want to use?

(b) How could you use steam without having to condense it?

Inventing the New Engine

(6) Watt took the next step; it was to turn the atmospheric engine finally into a steam engine. Once he had solved the problem of keeping the cylinder hot, he found that the expansive and elastic power of the hot steam could be used on both sides of the piston alternately. There could be two steam pipes one on each side of the piston so that the steam may be completely used as a moving force. Thus, in trying to correct a defect in the atmospheric engine, James Watt became an inventor. But for the searching questions he put to himself, he would not have developed the new model. Thus he became the father of the great prime movers that worked wonders in the nineteenth and early twentieth centuries.Watt had a scientific mind. He was never satisfied simply to observe and record a phenomenon. He had to know why, before he could go on to the next step; it is not surprising that Watt became a great inventor.

(a) Which property of the steam is used in the Steam Engine?
(b) In what ways is the new engine different in its functioning?

A3. Read paragraphs 5 and 6 and answer the following questions.

1. Give the contextual meaning of the following expressions in your own words:-
   (a) Raked his mind (P5 l5) ______________
   (b) Alternately (P6 l4)______________
   (c) Communication (P5 l11)__________
   (d) the great prime movers (P6 l10)_______
   (e) A Phenomenon (P6 l12)_____________

2. Rewrite the following statements in your own words using link words like so, though, because, etc.
   (a) Watt became ______a solution (P5 l1).
   (b) But as often happens, ________become (P5 l4).
   (c) But for the searching _______the new model(P6 l8).
   (d) He had to know _______the next step (P6 l12).

A4.(i) Answer the following questions:

1. Describe the use of the Newcomen Engine and its requirements for working.
2. Describe the problems Watt had to solve. What problems did he observe while trying to understand the working of the Newcomen Engine?
3. What experiment did he set up ? Why? What did he learn about steam from the experiment?
4. What was Professor Black's opinion? Was his explanation useful for solving the problem?
5. What are the innovative ideas that came to Watt? What did he do to convert the atmospheric engine into a steam engine?

A.4 (ii) Answer the following (interpretative)questions:

(1) Compare the uses to which steam was put to in the (a) Newcomen engine and (b) the steam engine.
(2) Identify values of professional conduct which you may have learnt from this lesson.

Session B: *Discourse Logic and Coherent Thinking: Understanding the Implications Inferences.*

Sets of statements are given below. Fill in the blanks with suitable words.

(i) (a) You have to_____the size of a plant bed by the full size to which the plant can grow.

(b) You have to ______the amount of the micro nutrient to be applied to the soil after determining how much the soil possessed already and how much the crop required.

(c) You have to ______the number and other details of the machine while ordering for the machine.

(d) You have to ___________if the pest attack is so much as to warrant the application of pesticide.

(assess, determine, specify, calculate)

(ii) (a) Some chemicals are ______into the stem or trunk of the plants by means of hypodermic needles.

(b) Sometimes certain beneficial insects are _______for the purpose of biological control of certain harmful pathogens attacking a crop.

(c) Green manure should be _____in the soil and well mixed if the crop is to benefit from it.

(d) Insecticides may be _____ either in the form of dust or through sprayers.

(applied, incorporated, injected, introduced)

(iii) (a) You may raise tapioca in one row and Bellary onion in _____row, and thus you may raise a mixed crop in ____rows.

(b) You may raise the mixed crops in ______ rows, an _____method is to raise a broad bed, grow onions on one side of the bed and tapioca on another side of the bed.

(alternative, another, alternate)

(iv) (a) Kekule believed that Benzene may have a ring structure; his ______experiments proved the truth of his belief.

(b) The understanding of organic compounds with ring structures has moved much _____from what it was a few years ago.

(c) The steam possesses energy to move things_____,its latent heat may be used to heat up six times its weight of water. These properties are put to use in the steam engine.
(farther, further)

2. You will find below sets of statements with a few blanks. The meaning relationship between the word (italicized) and the deleted word is one of modification (:emphasis, manner of action or time, etc).

Fill in the blanks suitably.

(1) It was an atmospheric engine and not a steam engine. Steam was __________ used to create vacuum and ________ to move the piston.
(2) The engine was used in coal mines; it required coal to produce steam for the engine. Actually it used________coal for its work than it helped to mine.
(3) When steam passed into cool water, it_______heated six times its own weight of water to the boiling point.
(4) "We have______made a great progress in the field of Applied Science" said Albert Einstein. What is ________required is to increase our concern for human welfare.
(5) Watt understood that steam could be used as a moving force; hence , his next step was to turn the atmospheric engine______into a steam engine.

3. A few sets of statements with missing portions are given below. The missing portions signal meanings in terms of purpose/result and state/condition or desire/will. Read them and complete the missing portion suitably from the given choices.

(1) James Watt was asked to find out how the machine could be made to work_______less coal (to use/using/for using).
(2) Cold water was shot into the steam______(to condense/condensing/for condensing) it into water.
(3) In the steam engine, steam is used______(to push/pushing/for pushing) the piston backward and forward.
(4) The main parts of a grain are embryo and endosperm; the

endosperm is the food reserve________(to use/used/using) by the young seedling during and after germination.

(5) The object of Pasteur's antiseptic method was______(to stop, stopping/for stopping) the germs from getting into the body.

(6) The more a scientist is observant the greater are his chances _______(to discover/discovering/of discovering) new things.

(7) When the penicillium mould grew, the microbes round it began______(to disappear/disappearing/for disappearing).

4. Sets of thought-units (:self-contained information blocks) with missing portions are given below. The missing portions are implications/inferences to be drawn from the given statements. Fill in the missing portions suitably.

(1) James Watt was asked to find out how the machine could be made to work using less coal, As it is, it________.

(2) When steam is cooled it gets condensed to water. So Watt passed steam into cold water expecting________________as it entered the cold water. It_______water but it gradually heated six times its weight to boiling point.

(3) Endomorphic form is a great disadvantage for any athlete; he is not likely to be successful. If a boxer is an endomorph, he_________.He will certainly______if he participated in a sprint event. So we would be much surprised if ________an Olympic gold medal in a sprint event.

(4) While the mesomorphic athlete tends to extroversion , the ectomorphic_______.

(5) Carbolic acid could kill the germs; it could kill the leucocytes (:white cells) also. It means that it_________as an external antiseptic but that it____________If it were injected into the body,_____________.

(6) When the penicillium mould grew , the microbes round it began to disappear indicating that______ Some _____grew right up to it and_____like the staphylococci stopped short inhibited by ______________.

(7) Agassiz asked me to study a specimen and to report to me in a week. When I______he said, "That is not right". Then I understood that_____So I decided to observe every detail of the specimen with greater attention.

(8) Shaler discovered that one fish could not be put under any category of Agassiz's classification. So he went to Agassiz and asked him_______Agassiz then said, "My boy, there are two of us who know that".Then Shaler realised that_______.

(9) Steam is an elastic gas; it can____or_______according to the volume of a vessel. If it is sent into a small cylinder, its ____but its pressure will____This property is used to move the piston_______in a steam engine. In short, in a steam engine, steam_________as a moving force.

5. Sets of thought-units with blanks are given below. Fill in the blanks appropriately using the words given in brackets.

(1) James Watt_______(stand) in his workshop____(look into) the parts of the Newcomen engine which he______(have) to repair. It_____(is) an atmospheric engine.

(2) The engine______(has a cylinder, a piston and a weighted beam to pull back the piston. Steam_______(shot into) the column below the piston and then cold water______(shot into) the steam to condense it into water. When the steam_______(turn into) water, a vacuum______(produce) in the column below the piston; then the piston______(force down) by the atmospheric pressure above the piston. Then a weighted beam______(pull the piston upward. Thus the piston______(move) upward and downward by atmospheric pressure and the weighted beam.

Session C: *Scientific Discourse: Implied Comparisons; Information Transfer*

1. The following diagrar is part of a text on "Fungi". Read the text and name the parts.

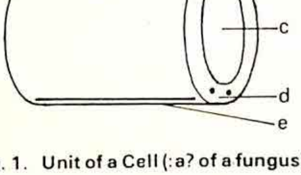


Fig. 1. Unit of a Cell (:a? of a fungus)

S C E R T
Calcutta
25/3

2. The passage describes the structure and class of fungi. Recall concepts (:terms) which you may know in relation to the fungi (For your convenience certain 'topical terms' are given to help you recall 'known' knowledge).

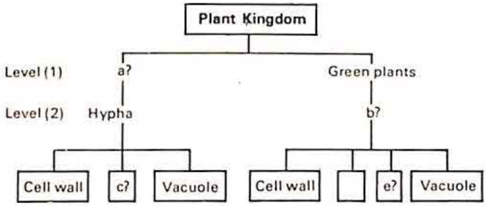
(1) Description (vide module 1c) : Shape :____________
size____
Identification : (unique) marks : ________________
(2) Classification order :_____________________
(vide module 2c) class : ______________________
Sub-classes :_______________________________
(3) Occurrence _____________________________
(& extraction: module 3c) __________________
(4) Properties :______________________________
(module 4c) :_______________________________

3. Read the passage and complete the chart and the table that follows:

Fungi

Structure : The fungi are included in the plant kingdom but in many ways they are quite different from green plants. The basic unit of fungus is a hypha and not a cell, although in some species the hollow tubes of the hyphae may be divided into cells by cross-walls. The cell walls may be of a nitrogenous compound and not of cellulose, though some scientists think that cellulose is present but not easily demonstrable. There is a central vacuole to each hypha, the cytoplasm forms a lining within the cell wall and many nucleii are embedded in this cytoplasm. Where the hyphae are divided into cells there may be one or more nucleii in each cell.

There are no chloroplast or chlorophyll in the fungi and the food particles in the cytoplasm may be oil droplets or glycogen, but not starch. The hyphal threads spread out over and into the food material making a visible mesh or mycelium. In some fungi they are massed to stools, though the organization and division of labour in the hyphae are never so complex as in the plants.



5. Complete the following table with the help of the given text.

Table: The basic units of a plant and a fungus

No.	Level	Basic unit of a small plant	Basic unit of fungus	
1.	Name			
2.	Form			
3.	_____			
4.	_____			
5.	_____			
6.	_____			

6. Comparisons and contrasts imply the existence of a basic frame of reference. This basic point of reference is sometimes not made explicit in science discourses. The reader has to guess this frame of reference, which is implied.

e.g. (i) The fungi are included in the plant kingdom.......The basic unit of a fungus is a hypha and a cell.

(a) What is the frame of reference? : plants

(b) What is the basic unit of this basic referential frame called? : cell

Read the following statements; identify the basic frames of reference, and rewrite the statements in discourse form supplying the basic referential information and linking them with suitable link words like 'but, however and similarly.'

(1) .______in some species the hollow tubes of the hyphae may be divided into cells by cross-walls.

(2) The cell walls may be of nitrogenous compound and not

of cellulose.

(3) There are no chloroplasts or chlorophyll in the fungi and the food particles in the cytoplasm may be oil droplets but not starch.

7. Using the information given in the following Table, write a note of comparison.

No.	Parasitic fungi	Saprophytic fungi
(1)	Lives on or in the tissues of another organism	on dead and decaying living materials
(2)	Causes diseases to crops	
(3)	Its enzymes can penetrate the cell walls of the host and digest	enzymes can only digest food material

Session D : *Integrated Grammar and Writing a Feature Story*

1. The following passage is a (short) feature story based on an interview; read the summary of the interview and fill in the blanks of the (expanded) feature-story suitably: "An Agricultural extension worker has an interview with one Mr. Narain Singh, a milk farmer of Gurdaspur District. The interviewer asks him (a) to narrate his 'earlier' difficulties in selling milk and (b) how the opening of a milk collection centre and a chilling plant in his village (:Verka) solved his problems in marketing the milk. (c) To a question as to why he preferred dairy farming to crop raising, Narain Singh replies that dairy farming is more profitable. In his four-acre farm, he raises cereals in two acres for his own use, and fodder for his cows in the remaining two acres. The dairy farmer, thus, convinces the interviewer that dairy farming is more profitable than crop raising for small farmers".

2. A feature story is a story of a farmer who achieved success by adopting a new farm technology. If people who read the story are to emulate the model of the successful farmer the narration of the farmer's difficulties and his/her successes should be done in the form of (a) a dialogue, (b) in the very idiom of the farmer and (c) highlighting the difficulties overcome (Clues to discourse structure

of a feature story are given in the margin for the use of Agricultural Extension workers). The following is a feature story based on the information given above. Read the passage and fill in the blanks suitably. After making your choice for each blank, refer to the clues given elsewhere and make your final choice.

Dairy Farming: A Way to Prosperity (A Feature Story)

(Location) Verka is one of the seven dairy projects established with US assistance in the last decade.

(Description of the farmer)

Typical of the____1____who supply the Verka milk plant is Narain Singh,______2_______the village, Choudhrywala in Gurdaspur district. He settled _____3____in 1947 with four acres of land. To____4_____his farm income he bought four buffaloes; but _____5______deliver the milk he had to cycle 32 _____6 ______(difficulties) daily between his house and Batala, the nearest____7____ "Milk is a perishable commodity, come rain or ____8_________ you have to deliver it" observed Narain Singh "In. ______9_____there was no go but to brave the ______10____-winds."

(Solution)

"I immediately started supplying milk to the ______ 11 _____ centre when it opened here at Mehta". Mehta,______ 12 _____ of the three milk-chilling centres attached to the _____ 13 _____ plant, when opened in May, 1962, eased his ____ 14 _____ somewhat, as it was 10kilometres from_____15____house.

(Solution)

Real relief came to him in 1963_____16____a collection centre opened right in his village. "____17_____, I have to walk only a few paces_____18_____deliver the milk," he added.

(A Question by the interviewer)

"Has it made ______19____difference to you in terms of money," I ______20______"Oh yes. Now I am assured of a______21_______price", replied Narain Singh. "Also, cash payment every ten_______22______. In the old days we were at the_______23______of the traders, and collecting the arrears was ______24_______difficult that at times we had to give _______25_______".

(Another Question) "Don't you find crop raising more profitable than______26_____farming?", I asked.

(Reply)

"No. This is more profitable._____27_________if my kids were slightly older, I would _____28_____ gone in for at least 15 buffaloes instead_____29_____the eight I now keep," replied Narain Singh. "Of______30 _____four acres of land that I have, I _____. 31_____two to cereals and the other two to _______ 32 _____ From the two crops of wheat and rice _____33_____ year, I get enough cereals for the family _____34______I also sell about a thousand rupees worth ____35______ the other two acres are devoted to fodder, and these buffaloes give me at least Rs. 5,000 a year in cash apart from all the milk, curds, lassi, butter and ghee we need. (*Span*, September, 1971, p. 35)

Clues for words: (first letter of the word and the number of letters in the words).

1. f(7), 2. 0(2), 3. h(4). s(10), 5. t(2), 6. K(10), 7. m(6), 8. s(5), 9. w(6), 10. c(4), 11. c(8), 12. o(3), 13. V(5), 14. t(4), 15. h(3), 16. w(4), 17. N(3), 18. t(2), 19. a(3), 20. a(5), 21. r(10), 22. d(4), 23. m(5), 24. s(2), 25. u(2), 26. d(5), 27. O(4), 28. h(4), 29. o(2), 30. t(3), 31. d(6), 32. f(6), 33. e(5), 34. a(3), 35. B(3).

Session E: *Listening and Oral Skills : Comprehending a Speech*

You will now listen to a speech delivered by Albert Einstein before the student-body of the California Institute of Technology. You may know that ALBERT EINSTEIN is the author of "The Theory of Relativity" and he is considered to be the greatest scientist of our century. The topic is: "THE UTILITY OF APPLIED SCIENCE"; the audience is made of students of advanced sciences. The occasion is a formal one.

1. Before you listen to the speech attempt to orient your mind to the theme of the talk. To help you do this, a few hints on the "topic" are given below; recall information which you may know on the sub-topics:

   (a) Subjects which are considered to belong to fundamental science:-
   (b) Subjects which are considered to belong to applied science:-
   (c) Uses of fundamental sciences: a few examples: ______
   (d) Uses of applied sciences: a few examples: ________
   (e) Beneficiaries of applied sciences and beneficiaries of fundamental sciences: ____________

E2 Now listen to the speech carefully. Do not look into the text (given at the end) and answer the questions that follow. For your convenience the recorded speech will be played twice. Choose the most suitable answer from the choice given under each question. Listen and answer the questions that follow.

3. Answer the following questions:

(i) The main theme of Albert Einstein's speech is _________
   (a) to praise the extraordinary progress of applied science
   (b) to feel sorry that much development in applied science has not taken place
   (c) to state that scientists should see how every individual may be made to live happily
   (d) to express his unhappiness that science is used for destructive purposes

(ii) A young man who had married a not very attractive wife, according to the speaker ___(a) does not live happily, (b) may live happily , (c) may be a liar, (d) will never speak the truth.

(iii) A Red Indian, according to the speaker, is as happy as any other civilised man _________.

(a) although he does not possess modern comforts like the radio, the fan, etc.,
(b) only when he possesses material comforts like the radio, the fan, etc.,
(c) because he is contented with what he has
(d) although he does not live in modern cities.

(iv) Modern applied science has brought __________

(a) physical comforts and freedom from drudgery,
(b) not any real happiness in the final analysis,
(c) wars and easy methods of killing the unwanted ones,
(d) man under the control of machines.

(v) Real human happiness, according to the speaker, lies _____

(a) in engaging oneself in the general cares of the humanity,
(b) in improving one's physical comforts,
(c) in enjoying sensual pleasures like beauty, taste, etc
(d) in making new innovations and discoveries.

(vi) Applied science should help every man __________

(a) with agents of destruction for wars,
(b) do a large number of things quickly during times of peace,
(c) free himself from drudgery so that he may cultivate his spiritual growth
(d) take interest in scientific pursuits.

(vii) Scientists should now __________

(a) stop their scientific pursuits as they are becoming more destructive,
(b) interest themselves in seeing that the benefits of science reached every human individual.
(c) interest themselves in fundamental science and develop

new disciplines like Biophysics,

(d) work out new diagrams and methods for populating the moon and other planets.

4 (i) Now listen to the speech along with the text. Note

(a) what words are uttered together as one unit,
(b) What parts of words and
(c) What words get high sound value. The speech will be played twice.

(ii) Read the text and check your answers

(iii) Note how the speaker introduces,

(a) simple and popular analogies
(b) figures and illustrations, and
(c) question forms to make his theme understood by the listeners. Mark these statements.

THE UTILITY OF APPLIED SCIENCES

My dear young friends,

I am glad to see you before me, a flourishing band of young people who have chosen applied science as a profession.

I could sing a hymn of praise with the refrain of the splendid progress in applied science that we have already made , and the enormous further progress that you will bring about . We are indeed in the era and also in the native land of applied science. But it lies far from my thought to speak in this way . I am reminded much more of the young man who had married a not very attractive wife and was asked whether or not he was happy. He answered thus: If I wished to speak the truth , then I would have to lie . So it is with me . Just consider a quite uncivilized Indian * whether his experience is less rich and happy than that of the average civilized man . I hardly think so . There lies a deep meaning in the fact that the children of all civilized countries are so fond of playing Indians. ** Why does this magnificent applied science, which saves work and makes life easier, bring us so little happiness? The simple answer runs: because we have not yet learned to make a sensible use of it.

In war it serves that we may poison and mutilate each other. In peace it has made our lives hurried and uncertain. Instead of freeing us in great measure from spiritually exhausting labour, it has made men into slaves of machinery, who for the most part complete their monotonous long day's work with disgust and must continually tremble for their poor rations.

You will be thinking that the old man sings an ugly song. I do it, however, with a good purpose, in order to point out a consequence.

It is not enough that you should understand about applied science in order that your work may increase man's blessings.

Concern for man himself and his fate must always form the chief interest of all technical endeavours, concern for the great unsolved problems of the organization of labour and the distribution of goods, in order that the creation of our mind shall be a blessing and not a curse to mankind. Never forget this in the midst of your diagrams and equations.

Sigma Xi Quarterly, 1938.

6. Glossary:

hymn:Song of praise to God
refrain: words or lines of a song which are repeated.
**Indian*: Red Indian, a native of U.S.A.
***playing Indians*: playing the part of an unsophisticated and innocent Red Indian.
mutilate: damage a part by cutting rations: weekly rations of food, sugar, etc.

MODULE 7 : SCIENTIFIC REPORTING IDENTIFICATION AND RECOMMENDATION

Session A: *Reviewing and Interpreting*

A1. (i) The following passage (by M B Khorey, ''The Sunday Standard' May 6, 1973) exemplifies a form of scientific reporting meant to influence the reader.Though the writer treats a number of subjects humourously in the passage, each unit is illustrative of (a) what information is selected and (b) how they are organized for scientific reporting. A scientist has to know (a) how to identify variables, (b) carry out experiments, (c) draw conclusions and (d) report the findings.

(ii) Pre-reading orientation

The title of the passage is ''Fantastic Tests'', (The title does not provide any clue to the subjects of the passage) it refers to tests and hence lists words which may occur in association with tests.

__________ __________ __________

__________ __________ __________

(iii) Setting up Reading Expectations

As there are no post-reading questions and sub-titles for the passage you may set up reading expectations by identifying the themes/ topics of the paragraphs and the conclusions in the passage. For this (a) skim the passage, (b) read the sentences beginning with link words like so, therefore and hence, and (c) identify the themes of the units. List your findings (in hints) in the columns given below,

Paragraph	(A) Theme/Topics	(B) Reported conclusions
1.	__________	__________
2.	__________	__________
3.	__________	__________
4.	__________	__________
5.	__________	__________
6.	__________	__________

(If one theme/topic is found described in one or more paragraphs you may indicate it by showing them in brackets).

(d) Now recall knowledge which you may know already on the information in columns (A) and (B). Set up reading expectations in the form of questions relating to (i) the information (:A and B above) in terms of your present knowledge and (ii) comparing the items in (B) with one another. (Set up reading expectations in the form of questions; illustration is given for one item).

Theme 1: Watches

a. What did the company do to prove that their timepieces were superior to those of other companies?

b. ____________________

Theme 2:

c. ____________________?

Theme 3: Squeak Transistor Radio

d. ____________________

Theme 4:

e. ____________________?

f. ____________________

Theme 5:

g. ____________________?

h. ____________________

(iv) Reciting for Reviewing

The passage deals with tests, and your reading strategy should be to review the experiment and the findings for interpretation. Hence, recall the information in the form of 'classified information'. (At the end of each unit, tabulated blanks have been given for your convenience). After reading each unit, fill in the blanks with relevant information (in the form of hints without looking into the passage).

(v) Interpretation

Interpretation is a process of analysis and synthesis. This process is carried out in two steps. (a) First, compare/contrast the presuppositions and the inferences (vide Aliv) of the writer with your expectations and expereinces. (b) Then draw conclusions on accepting/rejecting/using/modifying the new knowledge for problem solving/

better understanding. (You may learn to interpret by raising questions on the 'new' knowledge in terms of your knowledge and experience).

A2. A few model questions are given below. Answer them suitably after reading and reciting.

1. Why do advertisers resort to reporting scientific studies on their products? What did they do a decade ago? What does this change indicate about the consumers/buyers?
2. What are the units of information that compose scientific reporting? Are the conditions selected for the tests on squeak transistors valid and important ones? Are the buyers guided by the experimental information while buying radios. If no, what do they look for while buying radios?
3. What is the aim of the author of the passage? Does he succeed in achieving his aim? Illustrate your answer with reference to the unit on the Pallavan Transport?
4. What do you learn from this passage in respect of (a) advertisements and (b) scientific reporting ?

A3.

Fantastic Tests

(How to popularise your goods)

Some months ago/a Swiss firm/devised an extraordinary test/for its product. Whatever the fantastic test/proved [or not] for the quality of the firm's goods, it certainly made available /priceless material/for a subsequent campaign.

1.The company which makes superior watches reported: ''One of our time pieces/travelled from Le Havre to New York/and back/under the waters of the Atlantic Ocean, /towed all the way/by the liner 'Ile de France /at the end of a long platinum chain. The watch was examined by international experts/at the end of the experiment and/unanimously certified as working excellently''.

Subject____________

(a) Experimental conditions	(b) Findings
1.Long hours under water	____________
2. Travel under stress and strain	________
3.____________	________

(c) inference:____________________________

2. The report may improve the sales of the watches/in Zurich or Schaffhausen or/wherever the watch-making firm have their head office. But apart from any direct effect on the watch industry in general, /and this Zurich nor Schaffhausen company in particular/some quite unexpected results are bound to issue from this test. Probably manufacturers of all kinds of consumer products will now have to keep up with the Swiss Family Robinsons, so to say. Hereafter, winning of gold medals at international fairs will not have any publicity value. Unsolicited testimonials given by cinema stars will also lose their influence on the clever consumer. The whole philosophy behind newspaper advertisements will now need some serious revisions.What is required now is experimental verification and proof of the merits of every item marketed.

Name of the company:_________

(a) Purpose of reporting (b) result for the company

____________________ ________________

_____________ __________

(c) Inference: ____________

3. Hundreds of other consumer items/will have to be publicised/for quality via special tests. This is/how the transistor of tomorrow/ will be advertised:/One thousand Squeak Transitors/were played full blast/for six hundred hours continuously/._____We selected, residential as well as industrial localities/and tuned on the sets to every variety of radio programmes _____Carnatic Music, Khayals, Farm Broadcast,/ Political Talks/News/Vividh Bharati/Commercials._____What do you think happened?/ In all the 600 hours/only one frying pan was hurled at one set from a skyscraper at Napean Sea Road. This too was a pure coincidence. The flying frying pan was intended for a playboy husband who should have known that wives going off to their mothers for the weekends can suddenly decide to come back. Remember" Squeak Transistors satisfy the whole man not just his hearing aids".

Subject:_________

(a) No. (b) Experimental conditions (c) Result

1. ____________ ____________
2. __________ __________
3. ____________ __________

(d) Inference: ______________

4. Distillers or Toddy sellers had better plan a jolly good test right now for their advertisement campaign. Perhaps, we may see something like the following in our national newspapers: "Twenty five thousand two hundred and eighty seven people have now drunk Bunks Whisky for 90 consecutive days in an intensive test of its supreme qualities.These volunteers, men and women came from every age-group and from over 40 countries. At our expense, they drank Bunks Whisky at the rate of eight ounces per day at all hours of the day and under all kinds of mental states--aggressive, docile, gloomy, jovial, philosophical and quietly dazed.The volunteers were permitted to mix their daily ration of Bunks Whisky with whatever took their fancy--water, soda, tamarind juice, after -shave lotion and rasam. We refused to interfere even when one optimist insisted on diluting Bunks Whisky with more Bunks Whisky. And the participants in our unique test ate what they liked too, before, during and after those eight ounces. A panel of medical practitioners has certified that not one single person revealed the morning-after-illness at any time during the entire test or signs of senility. "Drink Bunks Whisky and be ever young and wise".

Subject: ____________

(a)	Experimental conditions	(b) Items tested under each condition	(c) Result
1.	__________	___________	_______
2.	_________	_____	_______
3.			
4.			
5.			

(d) Inference:

____

5.Semi government bodies, too, may have to follow this trend. This is what they may say in their future advertisements: Our buses have proved their merit in the most gruelling tests. They have run on desert sands; they have covered icy wastes. They have taken the jungles, ditches and ruts in their strides, they have survived even the narrow super highways of Tamilnadu. They have been systematically overloaded. All kinds of drivers have driven them: Well-trained drug addicts and angry women. We have dashed against every living and non-living things. We have run the engine on high octane, kerosene, vinegar, and once or twice on dhoby's ague mixture. We have sped for hours on flat tyres, over-inflated tyres and no tyres at all. We have journeyed with windows stuck when the thermometer was at 50° centigrade in the shade (humidity 99 per cent), with roofs leaking electrical fixtures shocking, seats ripped from here to there, cockroaches and other non-lethal insects crawling all over. These buses have finally been drópped from Arthur's Seat into the Valley below. Yet in the opinion of the Corporation experts, every single vehicle is perfectly suitable for city routes. "Travel by Pallavan bus; acquire Spartan virtues."

Subject :________

(a)	Experimental conditions	(b) Items tested Under each condition	(c) Result
1.			
2.			
3.			
4.			
5.			

(d) Inference:______________

A4. Refer to A1 (iv) and (v) of this module.
Assume that you are preparing a report on a Farm Tractor, for the purpose of extension education. List the variable conditions in which the Farm Tractor has to work and what experiments/tests you may set up to prove the merit of the tractor.

Session B: *Discourse Logic: empirical evidence and Interpretation*

B1. Sets of Statements are given below. Fill in the blanks with suitable words.

(i) (a) Tests were ______ to find out if our assumptions (hypotheses) are true or not to a given situation.
(b) Experimental plots were _____ to demonstrate the relative

merits of different procedures.

(c) Experiments were ______ to prove validity of the assumption.
(set up, devised, designed)

(ii) (a) Experimental verification is required to ______the merit of every consumer item marketed.
(b) Experiments have been conducted to _____standards and specifications for quality goods.
(c) Tests have been carried out to _____ if the chemical is effective against a 'given set' of insects.
(establish, prove, verify)

(iii) (a) There are certain physical and physiological _________in the plant which attract specific types of pollinators.
(b) There are certain ______ under which the plants would realise their full potentials.
(c) Based on a study of the ______ of plants we may select the one suited to our conditions.
(attributes, factors, conditions)

B2. Advertisement slogans are given below.These may carry cultural beliefs and presuppositions. Identify them (A few questions are given for you to answer and identify).

(i) Hereafter, winning gold medals at international fairs will not have any publicity value for products like cycles, motor cycles, etc.
(a) Who, do you think, win gold medals, and where?
(b) How are these winnings made use of by manufacturers of cycles, motor cycles etc?
(c) What does the word 'Hereafter' indicate as a cut-off point in time?

(ii) Unsolicited testimonials given by cinema stars will also lose their influence on the clever consumer.
(a) State the consumer goods or products for which the certificates given by cinema stars form the advertisements.
(b) Are these certificates of the cinema stars given voluntarily

by them or puchased for a price?
   (c) Whom will you call a clever consumer ? Why?

(iii) "Drink Bunks Whisky and be ever young and wise".
   (a) State the two important attributes people generally want to enjoy.
   (b) What are the reported inferences of the medical practitioners?
   (c) Do their findings find a place in the above slogan? How?

(iv) "Travel by Pallavan bus; acquire Spartan virtues".
   (a) Name a few virtues which were considered to have been possessed by the warriors of Sparta (: a brave Greek city state of the past).
   (b) Name a few conditions under which one may have to travel while going by the Pallavan bus.
   (c) What does the slogan promise? Will one acquire these virtues by travelling by Pallavan or should one possess them before venturing to travel by the bus?

B3. Sets of statements(in a jumbled order) are given below. Reorganise the statements in two ways: (A) According to normal usage, and (B) According to indicated needs of emphasis (or: topicalisation). Rewrite the sets suitably retaining the underscored statements in the given position. For purposes of emphasis, some statements are moved from their normal positions to topic or focus positions. Use proper link words and punctuation marks wherever necessary.

(i) (a) one of the timepieces travelled from Le Havre to New York and back
   (b) towed all the way by a ship
   (c) at the end of a long chain.
   (d) under the waters of the Atlantic Ocean. (topic)
   (f) the watch was examined
   (g) at the end of the experiment.
   (h) by international experts.

Answer
   A. ____________
   B. ____________

(ii) (a) The Squeak radio was played full blast for 600 hours continuously
(b) Only one frying pan was hurled at one set
(c) From a skyscraper at Napean Sea Road.
(d) In all the 600 hours (topic).
A.___________ (normal form)
B.__________(Topicalised form)

(iii) (a) For 90 consecutive days (focus)
(b) 25287 people have drunk Bunks Whisky
(c) In an intensive test of its supreme qualities.
(d) These volunteers men and women came from every age-group from over 40 countries.
(e) they drank Bunks Whisky
(f) at all hours of the day
(g) under all kinds of mental states (focus)
(h) at our expense
(i) at the rate of 8 oz.per day
A.___________(normal form)
B.______________(topic and focus)

B4. The following passage illustrates the use of impersonal forms in technical reporting. Fill in the blanks with suitable forms of the given words.

(1) After the test, the watch_____(a) _____(examine) by experts. It _____(b) _____(find) working excellently. The test _______(c) _______(prove) that the watch _____(d) ______(keep) time under all conditions of stress and strain.

(2) Bunks Whisky ___a____(test) for its quality by permitting 22827 volunteers to consume it at any part of the day and night. They ____b____(subject) to the drink under different mental states. Some of them ___c____(take) it in association with rasam and soda, a few _____d_____ (allowed) to dilute it with more Whisky. It __e___(prove) that the whisky did not produce the morning-after illiness with anyone of the volunteers.

B5. The following sets of statements describe the nature of experiments and the purposes for which the experiments were/are set up. Identify the missing portions and restore them.

1. The timepiece was towed (a) under water, (b) over a long distance and (c) in different kinds of rough seas in order to prove that it, ______ it ______ and it ______.
2. The manufacturers of the Squeak Radios wanted to establish that ________ and hence tuned their radios to every variety of radio programmes like khayals, carnatic music, political talks, etc. for testing.
3. The fact that the radio produced no noise even when played continuously for 600 hours proves that ____________________ ____________________.
4. The radio has been played in all varieties of localities, i.e residential and industrial localities, and the result indicates______. Hence it may be concluded that ________ ________.
5. Bunks Whisky was tried on (a) all kinds of people, men and women, (b) people of every age group and (c) people from over 40 countries. It __________ on them proving that __________ ______________________________________.
6. Bunks Whisky was allowed to be consumed (a) at any time of the day or night and (b) under all kinds of mental states in order to find out if ________. The test proved that ______________ ________________________.
7. The bus was run on high octane, kerosene and even vinegar to find out if ______________________________ ____. The test proved that ____________________ ______________.
8. The bus has been tested with overloaded passengers and on ill-kept roads and rough terrain. The bus ______ ______________________________ proving that ______ ________________.
9. The bus was tested by being dropped from a height of 2000 and the test proved ______________________________.

Session C: *Technical Discourse: Identification and Recommendation & Information Transfer*

1. Complete the following Table drawing the necessary particulars from the text given under C3.

N.	Crop	Name of disease	Causal organism	Symptoms	Control measures
(1)	(2)	(3)	(4)	(5)	(6)

2. The topic of the text is: Bunt: a fungoid disease of Wheat. Recall words/concepts you may know on (a) Wheat & its parts (b) fungi, (c) diseasedconditions noticeable in a crop, before reading the text.

   (a) Wheat & its parts ___________

   ____

   (b) Fungi _______________

   ____

   (c) identifiable symptoms of disease ____________________

3. Bunt- a fungoid disease

A casual examination of the ear of an affected plant does not reveal the presence of this disease, but when the grains are removed and broken they are found to consist of a mass of black spores, giving off a strong fishy odour. When threshing takes place the affected grains burst, discolour the healthy wheat and impart to the whole an objectionable odour. In this way not only is the yield of grain diminished but its value per cwt. is greatly reduced. If wheat is sown with spores of the fungus sticking to the grain, the seeds and spores germinate together and the fungus finds its way into the reproductive shoot, finally destroying every grain in the ear.

The disease can be prevented by dressing the seed with a suitable fungicide. At one time solutions of copper sulphate or formaldehyde were used. For many years dry dust preparations of organo mercury compounds were used. These are now being replaced by specially formulated liquid dressings of rather similar chemical nature. The dry dressings are used at the rate of from one to two oz. per bushel but good dry seed is not injured by rather larger dozes. The success of the treatment depends on the complete spreading of the powder over the surface of the grain and mixing should therefore be done in a machine or revolving container. An old butter-churn will serve as mixer but some special machines have an eccentric motion which makes their action very thorough.

4. Identify the functions of statements and their order in the text. The statements of identification will include the (a) Name of the disease, (b) Name of the causal organism and (c) Description of the symptoms. These statements will be followed by statements relating to the manner in which the disease may be controlled. These statements of recommendations will include (a) the name of the chemical, (b) the description of the quantity (c) the method of application and (d) the precautions to be observed whilé applying.

5. Study the following table and present the information in a paragraph of continuous writing following the examples of discourse of text C3.

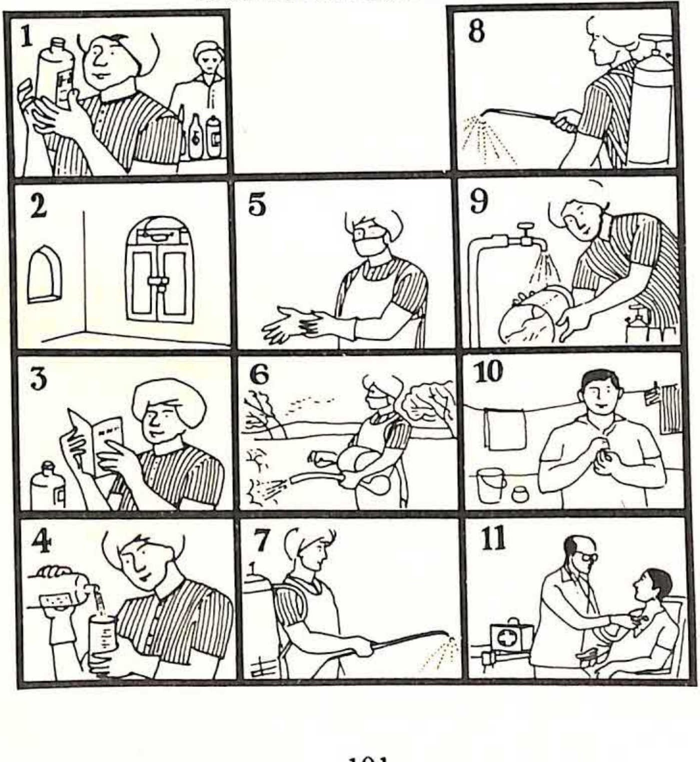
Crop	Disease	Casual Organism	Symptoms	Control measures
Wheat	Black	Fungus	(i) spots occur	(i)remove the barberry bushes, the second host
			(ii) black spores	(ii)spray fungicide (iii) develop varieties resistant to the fungus

6. Read the following text and present the information in the form of a table.
The red rot in sugarcane is caused by the fungus collecttichun filcatum.The disease causes the cane to shrink. The leaves wither and black specks can be noted on the shrivelled rinds.When the canes are split they give out sour smell.The disease can be prevented by dipping the cuttings in 5% formalin before planting. It is better to grow varieties that are resistant to red rot.

Session D: *Writing Do's and Don'ts in using Pesticides: Information Transfer and integrated grammars*

D1: Study the serialised pictures given below; the verbal description is given in the form of a cloze text. Fill in the blanks with suitable words. After filling in the blanks refer the clues given elsewhere and re-do the exercise accordingly.

Do's and Don'ts in Using Pesticides



1. When you buy a bottle of pesticide check up for the correctness of the chemical supplied from the label on the bottle of the pesticide. The label_____1_____indicate the information on the composition of the ______2________and the correct method of application for effective ______3______.

2. On returning home, keep the bottle in a ______ 4 ______ place. As the pesticides are harmful, you should _____5______leave them within the easy reach of the _____6_____. It is necessary you keep the chemical in ____7_______almirah under lock and key.

3. For preparing the ______8______for application study carefully the label on the ________9______or the departmental recommendation, and note down how ___________10 ________ of the chemical should be mixed with how _____11___ _____of water, in what order and under what _____12______.

4. While handling the pesticides put on the gloves; _____ 13 _____ out the exact quantity of the chemical from _____ 14 _____bottle without spilling. Prepare the mixture very carefully_____15_____to the procedure. Keep the mixture in a____16____place.

5. Before starting the spraying, put on your____17____so that the spray does not stain your____18____. Have a fine muslin rolled around your nose____19____mouth in order to prevent any spray particles____20___getting into your lungs.

6. While spraying, don't stand____21____the direction of the wind. If it is____22____keep the nozzle low or, direct the nozzle____23____that the wind does not carry the spray ______24_____ your face or elsewhere from the plants.

7. You _____25____use any kind of sprayer. But you should _____26_____ while spraying the chemical spread evenly on _____27______plants, and does not reach your face. If _____

28 _____ is windy or threatening to rain do not _____ 29 ____ spraying operation at all.

8. When the spraying is_____30_____, wash all the vessels thoroughly and make sure____31____the mixture is not left behind in the____32____or the vessel. Keep the leftover, if any, ______33_____ lock and key.

9. Wash the apron and other ______ 34 _____ and leave them to dry. It is necessary ______ 35 ______, in your own interest, you take utmost care in handling pesticides.

D3. (Clues)

1(m). 2(c), 3(r), 4(s), 5(n), 6(c), 7(a), 8(m), 9(b), 10(m), 11(m), 12(c), 13(m), 14(t), 15(a), 16(s), 17(a), 18(c), 19(a), 20(f), 21(a), 22(w), 23(s), 24(t), 25(m), 26(r), 27(t), 28(i), 29(u), 30(o), 31(t), 32(s), 33(u), 34(c) 35(t).

Session E: *Oral Skills: Raising Questions for clarification*

One should know how to raise questions for clarification and proper understanding of a subject. The following is a 'Question-Reply Chain'; read the dialogue and complete the missing portions relating to the questions raised by the student.

Genes

Teacher : The genes are the carriers of heredity; they carry not only information relating to heritable characteristics but also information relating to the sequence of time in which these characteristics changes get expressed.

Student : ______ by heritable characteristics?

T : By heritable characteristics, I mean those characteristics, which go from father to son or daughter.

S : _____ only from father to son?____ from mother to son?_____ to daughter?

T : Yes, from both father and mother.

S : _____ all heritable characters go from one's immediate parents?

T : Only to some extent____the characters of one's grandparents and great grandparent in the children?

S : Yes, I notice them_____include___all the characters of one's ancestors?

T : Yes.

S : _______by "sequence of time"?

T : A baby is toothless when it is born but it grows teeth about the eighth month; it moves on its fours when it is one year old. He stands up with support when he is 15-months old. Likewise developmental abilities come to him only at particular times, and also one after another in a particular sequence. The genes _______.

S : I understand 'sequence of growth' but________of physical growth?........genes to do with these abilities ?

T : No, it is not the result of growth. Growth and timing are ordered and directed by the genes.

S : ______directed only by the genes?________ no influence of environment?

T : No. It is not so. The role of the genes can be modified by the environment also.

S : _______the environment modify the effect of heredity? ________ what extent?

T : We can't specify that. We can say they have equal influence in shaping a child.

2. Read the following Technical report and raise questions for clarification of the given information.

A New Vegetable Developed

The Solan Agricultural Research Institute has developed a new vegetable/called turnip-sarson. This has roots of turnip and/leaves of mustard.

In this hybrid/leaves are tender, of mild flavour/and of good taste/and take much less time to cook than sarson. This combination/ also improves/the quality of turnip roots/by enriching them with more vitamins and minerals/, The new vegetable has been produced by hybridizing/an exotic strain of sarson with the purple-to-white globe turnip. (*Indian Farmers' Digest* -March, 1973)

HOW TO SAVE ENERGY ON THE FARMS

MODULE 8: DESCRIBING/DEFINING RELATIONSHIP

A1.(i)The most important topic of our times is "Energy and How to use 'Solar energy' and other similar forms" and overcome problems of using non-renewable forms of energy like petrol. The following passage, "How to save Energy on the Farm" is an excerpt taken from "Rays of Hope" by Danis Hayes. It is the capacity for problem identification/problem-solving which makes a scientist what he is (As a student of science you must develop this capacity).

(ii) **Pre-reading Orientation**

Recall words/concepts you know on the title of the passage i.e., (a) farm operations, (b) forms of energy available for use and (c) forms of energy used in the operations.

(a) kinds of farm operations	(b) forms of energy	(c) forms of energy used in farm operations
______	______	______
______	______	______

(iii) **Skimming and Scanning :**

Your purpose in reading the passage is to take down notes on the new information/a procedure/point of view presented in the passage. In relation to your pre-reading orientations and your purpose, skim and scan the passage noting down the following items for each paragraph (or: thought-unit).

(a) Title or sub-titles/Table/diagrams, if any,
(b) Key words in the first and last sentences of each paragraph,
(c) Proper names and
(d) statements within quotation marks, if any.

e. g. P1 (a) ______ (b) ______
(c) ______ (d) ______
P2 (a) ______ (b) ______
(c) ______ (d) ______

(iv) Setting up 'Reading Expectation'for Note-taking

'Note-taking is both (a) a process of recording all the information in a comprehensive and brief manner and (b) a product (: a summary) for Reviewing and Interpreting. Hence Note-taking may be done in the form of charts, diagrams, tabulated information, etc. (vide Sessions 'C' of the modules). Based on your knowledge gained through skimming and scanning (vide (iii) above), select suitable verbal (like mnemonics) and non-verbal forms (like charts) for recording the contents of the passage (For your convenience, the following 'classified form' is given. Note the 'relevant' contents in the form of key words/phrases in the space provided for it under each pargaraph)

Title/sub-title· (if there is no sub-title, provide one appropriately)

(a) energy-related farm operations/ topics	(b) suggested/ described forms	(c) claimed results/ advantages, etc.

A2. Note taking for Reviewing and Interpretation

Read each paragraph of the following passage carefully, recite and review each paragraph (as you did for Modules 6 and 7) by putting down your answers in the 'form' (selected for note-taking) given under each paragraph. (Question for Reviewing and Interpretation (from 'notes') are given under A4; don't refer to them at this stage).

How to Save Energy on the Farms

1. The average well-fed person uses about as much energy each day as a steadily glowing 100 Watt bulb. This energy, measured as calories, is in fact stored solar energy. Plants convert sunshine into chemical energy through photosynthesis. The sunlight plants capture works its way through the animal kingdom along food chains losing energy at each level. In terms of energy efficiency the history of agriculture has been a story of near constant decline. Hunting and gathering societies invest less energy in obtaining food than do societies with planned cultivation. In the early days of agriculture, the energy put into cultivation was all derived from human muscle. Today, Professor David Pimental of Cornell University calculates

that the average US farmer uses the energy equivalent of 750 litres of petrol to raise a hectare of maize.

1(A) ____________

(a) ____________

(b) ____________

(c) ____________

2. Where agricultural lands have underground water, tube wells should replace or complement streams and reservoirs. Lifting water can require prodigious amounts of energy as modern irrigation systems rely mostly upon non-renewable sources. The oldest of the energy form used is gravity, which captures rain at higher elevations and channels it downhill. Some 2,000-year-old Roman aqueducts still function admirably without ever having consumed a drop of oil. China with 40 per cent of world's irrigated land has also put gravity to work. Four-fifths of its irrigated land depends upon gravity or animal power. Biogas, a mixture of methane and other gases produced from animal excrement and crop residues, may be a significant new fuel; already some conventional pumps in India appear to use it.

2(A) ____________

(a) ____________

(b) ____________

(c) ____________

3 Techniques that use water more efficiently must be devised. In trickle irrigation a small amount of water is delivered in a measured amount to each plant. It is costly, but it saves water and energy.

3(A) ____________

(a) ____________

(b) ____________

(c) ____________

4. The introduction of mechanised farming in poor countries can be inefficient and disruptive. When the conditions of the recipient are ignored, the new technology may prove more troublesome than the problems it was supposed to solve. Appropriate

technologies would help smooth out the employment peaks, increase productivity, reduce one major impetus to population growth and increase food output.

4(A)________________
(a)________________
(b)________________
(c)________________

5. Drying poses a particular problem in countries where harvesting of one crop and raising of another crop fall during one monsoon. Since there is little sun during the monsoon season, grain drying equipment may have to be powered by methane generated through anaerobic digestion of field residues.

5(A)________________
(a)________________
(b)________________
(c)________________

6. Compost piles provide rich fertilizer while reducing the amount of garbage. Growing food at home eliminates much of the need for fuel for processing and transporting. Home gardens also require fewer pesticides because crops can be mixed to provide a less attractive target for pests, and people who would not buy a blemished tomato will eat one out of their own garden. It is in the manufacture of fertilisers and pesticides that quite a lot of fossil energy--the non-renewable energy--is used up.

6(A)________________
(a)________________
(b)________________
(c)________________

7. Energy is rapidly becoming the most critical variable in the world food system. Most of the good agricultural land is already under cultivation. Farming marginal lands brings dire and sometimes irreversible ecological consequences. And the productivity of existing farm lands can be increased only through the wise use of

energy.

7A____________________

(a)_______________

(b)_______________

(c)_______________

A3. Read paragraph 2 and answer the following questions:

1. Rewrite the sentence beginning with, 'Lifting water _______
2. Identify the referents of the following expressions:
   (a) it (16) (b) its (19)
   (c) a drop of oil (17) (d) it (113)
3. Illustrate what the following expressions mean in the given context (: give suitable examples):
   - (a) Lifting water (12)
   - (b) Non-renewable sources (14)
   - (c) Irrigated land (19)
   - (d) Gravity (19)
   - (e) Animal power (110)
   - (f) Crop residues (111)
   - (g) Conventional pumps (112)

A4. Note-taking and Interpretation

Notes for the passage (vide A1 iv) and questions of interpretation on them are given below: Answer them suitably

______Plant food
v
(1) Man-100 watts x 24 hours v [para 1]
______Animal food

(a) Explain how plant food becomes animal food.

(b) Reason out if there is any advantage for 'man' if he consumed animal food, and used the plant food only for raising animals (for food).

(2) Lift irrigation-use of — Roman Aqueducts
'gravity/ ___ Chinese canals
animal power (Para: 2)

Reason out if 'gravity' or 'animal power' could be used for

'Irrigation' in drought prone plants.

Open Irrigation_______> Wastage and inefficient use
(3) Limited water
Trickle Irrigation______> effcient use & no wastage (para3)
(drip) (:costly)

Reason out if 'Trickle irrigation' can be practised for raising rice crop or any other crop.

(4) Animal wastes + crop residues ----->Bio-gas
____ heat energy for drying
_____fuel for cooking
___thermal current for pumps
_____residues as 'manures'
(Para 2 & 5)

(a) Reason out where 'biogas' plants can be established for deriving these benefits and how?
(b) Can we have a small 'biogas' battery for each house?

(5) Reason out why bio-gas and animal power are described as renewable sources of energy? Illustrate your answer.

B1. Sets of statements are given below. Fill in the blanks in each set appropriately from among the words given in brackets.

(i) (a) The plants store food in roots or leaves or stems_____ to convert it into energy at times of need.
(b) Animals also store food______the plants but in the form of fats and tissues.
(c) As food is converted into energy at the time of work, the food requirements of a person is expressed _________ calories per day.
(d) When work is described_______calories, it means that the work involves heat energy ; when it is described_____ horsepower it means that the work involves movement.
(as, so as, like, in)

(ii) Scientists undertake research with the________of identifying solutions to the problems faced by the society; they identify the problems and set up experiments with the_____of verifying whether a particular solution would serve well under a given situation. However, their______will be professional development.

(target, aim, goal, objective)

(iii) The plant scientists carry on experiments to______the performance of a plant variety; in particular, their aims are generally to________________the desirable characters of the plant and to______undesirable characters. However, their ultimate goal is to______the yield of the crop in the farmers' fields.

(enhance, reduce, inrease, improve)

B2. Sets of thought-units containing generalization and illustration are given; fill in the blanks. The blanks may take one or more words.

(i) Athletes in general love to command people and be dominant. Both endomorphic and______a_____athletes have this.____ b_________character, whatever may be their form and shape. Similarly, both men and______c_____have it_____d_____that sex____e____any difference in respect of this character.

(ii) The fat and the lean athletes are different not only in shape and size but also in temperament. The fat person _____ a ____ an extrovert____b____company and fun; but the ___ c ____ person ______d____an_____e____preferring ____f____ However, both are dominant whether they_____g_____fat or_____.

(iii) The white cells of the blood are the soldiers of the body. So they rush out to fight the germs whenever the germs ___a___ the human body. The battle __b__until the germs ___c___. Fever __d___ a symptom which __e___that the battle ___f___in the body.

(iv) Non-renewable sources of energy like naphtha and coal are used in the manufacture of fertilizers. As these sources are getting __a__year by year, there _b__ a time when these sources are __c__used up. So before we _d__that stage we must learn __e__renewable sources of energy like _f__and ___g__ in the manufacture of fertilizers.

(v) Photosynthesis is a process by which chlorophyll _a__starch from carbon dioxide and water in the presence of __b__. In short __c___plants __d__solar energy into chemical energy and __e_ it __f_ starch in roots or stems.

B3. Fill in the blanks with suitable forms of the words given in brackets. Read the illustration given below and understand the use of the italicized forms.

e.g. *Hunting* and *gathering* societies invest less energy in *obtaining* food than do societies with *planned* cultivation.

(i) ____(Irrigate) land depends upon channels and wells for ___(get) regular supply of water.

(ii) The introduction of ___ (mechanise) ____(farm) in a poor country may prove to be inefficient.

(iii) _______(Dry) poses a particular problem in countries where ________(harvest) of crops (take place) during rainy seasons.

(iv) Compost piles provide rich fertilizer while _____(help) to _____(reduce) the amount of garbage at the same time.

(v) ____(Grow) food at home eliminates much of the need for fuel for ____(process)and ____(transport) the _____(harvest) yields.

(vi) ____(Farm) marginal lands brings a number of problems. It is better that the productivity of ____(exist) farm lands ______(increase) through wise use of energy.

B4. Sets of statements consisting of 'Definitions ' and consequences/ unique conditions are given below. Complete the missing portions in each set. Small blanks (xxx) are meant for link words.

(i) A crop gives maximum yields when raised in the proper season. __a (xxx) a farmer ___b____if __c__.

(ii) High yielding varieties (HYV) respond to higher doses of Nitrogen fertilizer. The farmers growing HYV crops ______a______if _________b_________.

(iii) Certain varieties like CO43 have been found to grow well even under conditions of drought and also in saline soils. ___a(xxx) farmers with _b__and ____c____ if ______.

(iv) Action and reaction are equal and opposite; when two moving bodies collide, will __a__? Experiments show that there is loss of 'energy' when two _____b____.__c__(xxx) the second law of motion is not always true under all conditions.

(v) Photosynthesis is a process by which plants convert sunshine into chemical energy. It means that when __a_, photosynthesis __b__and that __c__ will not be produced.

(vi) Techniques of using water more efficiently need to be followed. Drip irrigation is one such technique. __a___(xxx)___this technique _b__in places where___c___

(vii) The introduction of mechanised farming in poor countries can be inefficient. __a__(xxx) the machines are likely to be costly; the farmers __b__; __c__(xxx) the farmers may not know ___d__if anything goes wrong with the machines. Lastly, in countries where ____e_____the introduction of mechanised farming will lead to problems of unemployment.

B5. Make a brief note making use of the following key words.
Biogas-- recycling waste matter-- animal excrement-- crop residues-- energy-- renewable one-- as fuel-- as energy-- pumping for irrigation cost on non-renewable energy-- increased production --increased profit.

Session C: *Definitions in Technical Communication*

Definitions are descriptions of science concepts and terms. They generally state what a thing and its characteristic features are in a comprehensive way. In short they are statements of (a) principles of classification, (b) names of classes/sub-classes and (c) their distinguishing properties.

C1. The following passage entitled "Energy and Energy Conversion" carries quite a number of definitions of energy, ecology, energetics, etc. Before starting to read the passage recall relevant information (words/concepts) on the words in the title and the sub-titles of the passage. For your convenience clues are provided in terms of the. 'information components' of the definition.

Terms	Classified forms	Principles	Properties/ relationships
Ecology:			
Energetics:			
Work:			
Energy:			

C2. Study the diagrams and the chart that accompany the passage. A few questions are given for you to answer with the help of the passage.

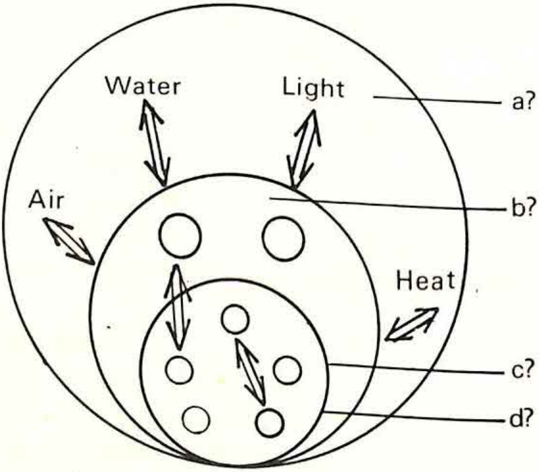
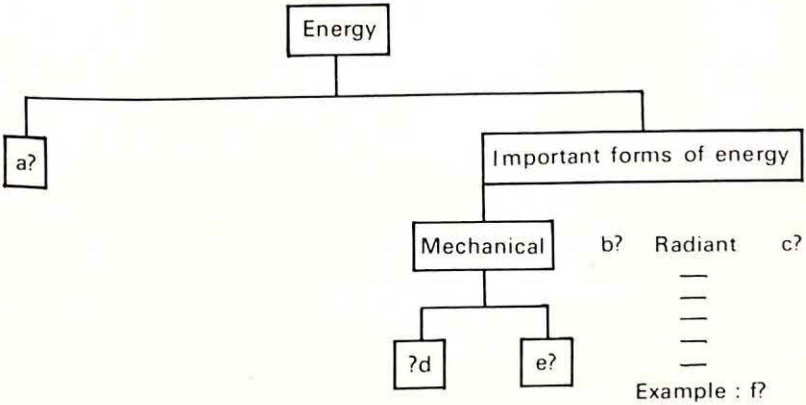
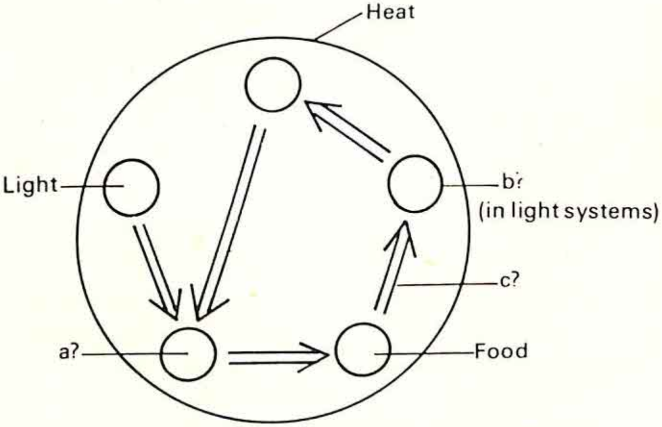


Fig. 1. Ecological Relationship





An example of energetics in operation

(iv) How does Odum define Ecology?

Energy and Energy Conversion

Ecology and Energetics: Ecology is that branch of science which deals with the relationship between living things and their physical environment together with all the other living organisms within it. Organisms and the physical environment in which they exist form what, for convenience, is termed as ecosystem. Ecology can, thus, be described as the study of the inter-relationships within ecosystems, or as ODUM (1959) prefers, the study of the structures and function of 'nature'. Energetics in the context of this book is concerned with the energy transformations which occur within ecosystems.

Before examining the ecological aspects of energetics it is necessary to consider the concept of energy and the laws which govern energy changes.

Work and energy: Energy is the capacity to do work. Various forms of energy are recognized, but those of greatest importance to living organisms are mechanical, chemical, radiant and heat energy.

Mechanical energy has two forms--kinetic and potential. Kinetic or free energy may be described as useful energy which a body possesses by virtue of its motion and is measured by the amount of work which is done in bringing the body to rest. Potential energy is stored energy, only potentially useful until its conversion into the kinetic or free form when it becomes available to accomplish work. Conversion from the potential form to the kinetic involves movement.

All organisms must work to live and, therefore, require a source of potential energy which can be utilized. This is found in the chemical energy of food. Assemblies of atoms in matter can be rearranged into different groups and thus by movement of atoms, chemical energy is liberated. The combustion(:oxidation) of coal in a furnace, or of food by respiratory process, releases energy which can be used to accomplish work. Both illustrate the conversion of chemical energy to mechanical energy.

The sun, a vast incandescent sphere of gas, releases energy by the nuclear transmutation of hydrogen to helium, and it is upon this energy that life on earth depends. Solar radiation is energy in the form of electromagnetic waves involving a rhythmic exchange between potential and kinetic energy.

C4. Some statements define concepts and terms. They state what a thing or its characteristic feature is in a comprehensive way. Study the following example.

(i) Ecology is that *branch of science* which *deals with* the relationship between living things and their physical environment together *with all other living organisms* within it.

In this definition the term (T) defined is Ecology and the next 'C' puts the term in a general class or category and d^1/d^2 (distinguishing features or properties)

(ii) Using the above example, identify the class name (c) and the distinguishing features (d) of the concepts/terms defined below:

(a) A gas is a fluid that has neither a definite volume nor a definite shape.
(b) Energy is the ability to do work.
(c) Ecology can be described as the study of the interrelationship within ecosystems.
(d) Ecology is the study of the structure and function of 'nature'.

(iii) Formulate definitions for the given "Terms" using the given bits of information.

T	C	d
Solar Radiation	energy	form of electro-magnetic waves. involves a constant exchange between potential and kinetic energy
Oxidation	chemical reaction	elimination of hydrogen atom. addition of oxygen atom

C5 (i) A technical thought unit (:discourse) involving a definition may carry functional statements like the statement of definition (or generalization), classification, distinguishing features (or :consequences) and example (exemplification). These statements may occur in a particular order. Read paragraph 5 and identify the function of each statement and the order of the statements.

(ii) Statements in the following sets are in a jumbled order. Rearrange them providing suitable link words so as to form a coherent thought-unit.

1. (a) The composition of matter is divided into three ingredients: protons, neutrons and electrons.
   (b) Matter is anything that occupies space and has weight.
   (c) Matter can exist in any of the three forms, viz. solid, liquid or gaseous.

2. (a) For instance, the combustion of food by respiratory process releases energy for use.
   (b) By the movement of atoms, chemical energy is liberated.
   (c) Food offers us a source of potential energy which needs to be liberated at times of our use.
   (d) When atoms in matter are moved to form different groups, chemical energy becomes available for use.

Session D: *Form of a Technical Bulletin and Integrated Grammar*

The following cloze text, "Tea for Nature Cure" is a 'technical bulletin'– an expanded version of the report given below (D1).Study the report carefully and fill in the blanks in the cloze text with suitable words.

1. Experiments on Tea

Experimental results conducted in Bogomelets Physiology Institute in Kiev reveal that rats treated with tea extract did not develop leukemia on exposure to radio-active materials. The results of the experiments conducted on humans in Physiotherapy Hospital in Bhatumi, U.S.S.R. also indicate that tea is curative against ailments like blood pressure, rheumatism, intestinal bacteria and stone-formations in bladder, liver and kidney. Among all the varieties tested the green tea is found to possess all these properties in the highest measure.

2. In a Technical Bulletin, information is generally presented in a particular order. Words given in brackets in the margin will show what information is selected and how organised. Read the following cloze text and fill in the blanks suitably.

Tea for Nature Cure (Technical Bulletin)

(where?) Soviet scientists have found that tea has many
medicinal properties. In an _1__that was carried out,
and repeated for verification___2___ the Bogomelts.
Physiology Institute in Kiev mice were _ 3 __ to the
(what?) effects that come out of exposure __4__rays from radio-active
(procedure) minerals. When they developed leukemia
__5__animals were divided and kept separately as two
_6__One was left without medical aid, the other __
(results) 7__regularly given a concentrate of catchins, organic
compounds _8__from tea. Only the mice in the group
_9__was treated with tea survived.

In a control ___10_ on patients conducted at the
(where) Physiotherapy Hospital in ___11___in the Union of
(what) Soviet Socialist Republic, it was _12_ that a 'course'
in tea-drinking reduced the __13__ processes of rheumatism,
brought down considerably arterial pressure
(results) __14__ had an antibiotic effect on diseases such as
___15__and other stomach disorders. Tea is also an
____ 16_____remedy for preventing the formation of
stones in __17_ urinary bladder, liver and kidneys, the
men from _18_country report. They report having
tested with fourteen __19__. The strongest antibiotic
properties were allegedly found in _20_ tea.

3. (cues for words: only the first letter of the word given)
1(e), 2(a), 3(e), 4(t), 5(t), 6(g), 7(w), 8(e), 9(w), 10(e), 11(B), 12(f), 13(i), 14(a), 15(d), 16(e), 17(t), 18(t), 19(v), 20(g).

Session E: *Listening comprehension -A playlet*

You will listen to a playlet, "Fable of Ben Adam", written by Art Hoppe. The players are: a narrator of the context, Ben Adam (father), Irwin (son) and an angel. The son accuses his father for the fault of his generation in having militarised the world through scientific innovations like the Atom Bomb. Later, an angel arrives on the scene to applaud Ben and his age for their search for scientific wisdom. Real concern for human welfare should be the only motive force behind the work of scientists.

1. **Pre-listening orientation**: If you have read the poem 'Adu' Ben Adam, (by Leigh Hunt) recollect why the angel 'writes the name of Ben Adam on top of the list of those whom God has blessed'.

Before you listen to the 'play' orient yourself to the theme of the play. Attempt to recall words/concepts you may know on the benefits and miseries which may come out of the Atom Bomb.

The Atom Bomb

Benefits	Miseries
______	________
______	________

2. **Setting up Expectations**

Listen to the speech carefully without looking at the 'text' (given at the end) and answer the following questions.

(a) What is the attitude of the narrator towards Irwin? Give reasons.

(b) What is the attitude of Irwin towards his father, Ben Adam? Give reasons.

(c) What does Ben Adam feel about the work of his generation of people?

(d) List two problems which, according to Irwin, have made the world poorer and more terrific.

(e) What, according to the angel, have been the motives of the people whose actions are condemned by Irwin ?

(f) Do you agree with the Angel's viewpoint? Give reasons.

3. Listen again and check your answers. After you have done this, you may go through the text given below.

4. Fable of Ben Adam

Narrator: Once upon a time/there was an American named Ben Adam who, like most members of his country's Older Generation/had little hair/and overwhelming guilt feelings./He had a son/named Irwin./ Like most members of the younger generation,/Irwin had lots of hair/and an overwhelming contempt for anybody over 30./Ben Adam, and his son Irwin fell into a conversation one day.

(Point of view) Irwin: What mess/your generation had made of things?/Because of your bumbling,/we now face a society/that's militaristic and overpopulated /No, it is not only that./Our homes and living places are polluted./Still worse, you have terrorised the world/with the Hydrogen bomb./

Ben: (nodding guiltily) Do you feel so my son? I guess we're about the worst generation that ever lived.

Irwin: You may think it is not anybody's concern? We are worried a lot about it. It is past mending. The sooner we get out of this mess, the better_______

Ben : I'm sorry, Irwin, You_________

Irwin: You may say your parents and grandparents left the world poorer and more terrific. So what? You should have been more responsible and more sensible. I'll have no truck with you people.

Narrator: Irwin shrugs his shoulders and goes off
(sly comment) with his friends to smoke marijuana. Ben Adam could not help feeling that he was in for a bit of divine wrath in return for his sins. He was therefore somewhat shaken on awakening one night to find an Angel at the foot of his bed writing in a Golden Book.

Angel: I have come, 'Ben Adam' to grant you one wish.

Ben: (Surprised) Me?_________Why me? I fear there's some mistake.

Angel: You've been selected by the Heavenly Computer as typical of your generation. And your generation is to be rewarded for its magnificence.

Ben: I beg your pardon. There must be some mistake. Would you mind repeating that?

Angel: I repeat: your generation is to be rewarded for its magnificence. There is no mistaking about it. It has been decided after careful analysis. What makes you doubt it?

Ben: Why, we militarised our democracy. When I was a boy, we had an army of only 1,34,000 men________

Please don't trouble me any further. I should be a fool to believe you. And Irwin had just now condemned us for militarising.

Counter View -point CV-1

Q1

Angel: Well, You built an army of four million men; but you did it only in the hope of bringing freedom and democracy to the world. Truly, a noble goal.

Q2

Ben : Well, may be________But, is it not a fact that we polluted the water and the air? I would rather we did not scatter rubbish far and wide. I think we don't deserve any good.

CV-2

Angel: No, you should not think like that. Is it so bad as that? Your intentions were good. Were your intentions bad? No, not at all. The environment is polluted only because you constructed the most affluent society the world has ever seen.

Q3

Ben: I guess that's so. But look at the population now threatening mankind. Think of famine and pestilence for a while. What do you say to population explosion? Do you pardon us for that?

CV-3 Angel: It is nothing; because your generation cured disease, increased the food supply and with that, lengthened man's lifespan. Isn't it a tremendous achievement? Don't worry about these things.

Q-4 Ben: Are we not responsible for the Hydrogen bomb? What a legacy to the future? I suppose, we have no excuse to offer. Did you take into account the Hydrogen bomb?

CV-4 Angel: As to the Hydrogen bomb, you went in search of wisdom and so unlocked the secrets of the atom. What a glorious triumph !

Ben: You really think so?

summary Angel: Yes. Your motives were excellent, your goals ideal, your energies boundless, and your achievements tremendous. And you did everything with the best intention. In the aeons of mankind, the names of your generation lead all the rest. And therefore, Ben Adam, by the authority vested in me, I grant you one wish. What shall it be?

Ben: (With a sigh) I wish that you'd have a little talk with Irwin.

(Adapted from ''Fable of Ben Adam'' by Art Hoppe, Readers Digest, January, 1972, pp. 125-6).

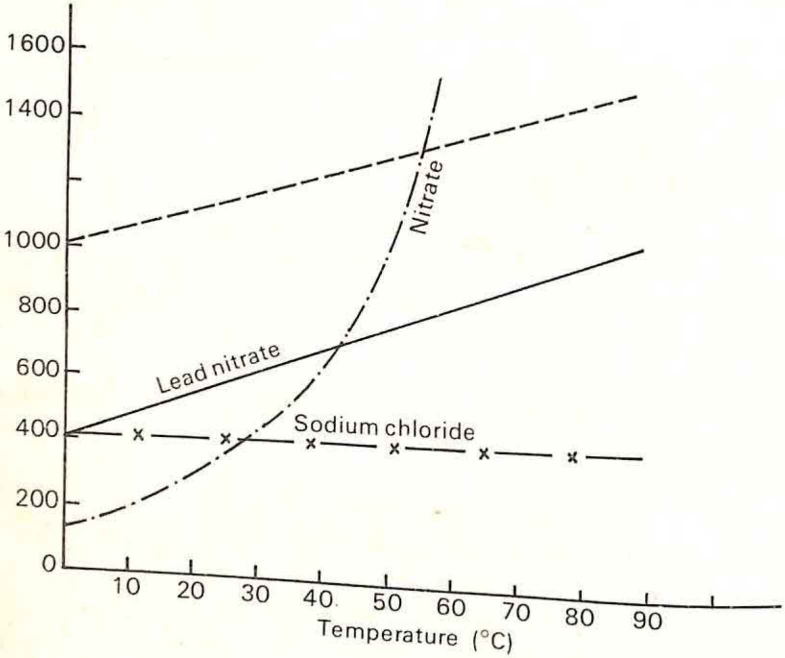
5. Listen to the play again and identify the expressions which signal: (indicate) the following interacting functions during conversation.
   (a) (politely) seeking clarification
   (b) polite general requests
   (c) seeking apology
   (d) politely rejecting

6. Discover the relationship between the following poem, ''ABOU BEN ADHEM'' and this play-let.

Abou Ben Adhem, (may his tribe increase!)
Awoke one night from a deep dream of peace,
And saw, within the moonlight in his room,
Making it rich, and like a lily in bloom,
An angel writing in a book of gold:-

Exceeding peace had made Ben Adhem bold,
And to the presence in the room he said,
'What writest thou?' - The vision raised its head,
And with a look made of all sweet accord,
Answered, the names of those that love the Lord.
'And is mine one?' said Abou. 'Nay, not so,'
Replied the angel. Abou spoke more low,
But cheerily still, and said, 'I pray thee, then,
Write me as one that loves his fellow men.'
The angel wrote, and vanished. The next night
it came again with a great wakening light,
And showed the names whom love of God has blessed,
And lo ! Ben Adhem's name led all the rest.

by Leigh Hunt J.H. (1784-1859)



THE SCIENTIFIC METHOD

MODULE 9 : EVALUATION/CONCLUSION

Session A: *Library Reading Orientation: The Blurb and The Introduction*

(i) One of the important values of science is 'not to be dogmatic' in respect of existing definitions or concepts. One should always be willing to raise questions like, "Why so?/Why not it be different?" This attitude makes a scientist what he is. The passage given below exemplifies the importance of this attitude.

(ii) The introduction to the book 'Science' written by Pomery H. John is given below. The introduction describes (a) the objectives of the writer, (b) the level of the 'Readers' for whom the book has been written and (c) the depth and up-to-dateness of the book. Hence by reading the 'introduction' you may estimate whether the book would serve your needs or not. Whenever you want to select a book for library reading you must make selective reading of the following 'items' in the book: the year of publication, the blurb (if any), the introduction, the chapter headings, the index, etc. In this module, you will learn to estimate the usefulness of a book by reading the 'blurb' and the 'introduction'. (In the next module, you will learn to test-verify the usefulness of the book and confirm by going through the 'Chapter headings' , and selective reading based on 'Index').

(iii) **Pre-reading Orientation for the Book**

Go through the 'items' in the book, and answer the following questions (:reviewing).

(a) *Questions for Reviewing and Evaluation*

Answer the following questions

(1) Is the writer a recognized scientist in this field of work?

(2) Is it an old book or a recent one? Is there a likelihood of a more up-to-date book on this subject?

(3) Is it written for specialists in the subject or for a general audience?

(4) Has it been popularly read/reviewed by specialist or general readers?

(5) Is it a book on any specific branch of discipline or a comprehensive book covering all developments?

(b) *The Title of the Book:* SCIENCE

(c) *The Blurb:* (may be found on the outerside of the wrapper)
Pomery H. John: A biologist by profession, he has published many books on scientific marvels like The Pre-historic Giants, The Fishes of the Dark Seas, etc. He has a flair to present even difficult science information in a simple and easily understandable style. The book 'Science' may be called the History of Science as it sets out to trace and describe scientific developments in the last 150 years in a popular style. Every student has something to benefit from the book.

(d) *Other details:* (First Edition, 1962) Fifth Edition, 1964. Holt Rinehart and Winston, N.Y.

(iv) **Pre-reading Orientation for the 'Introduction'**

Recall information you may know on ''Science'' --the title of the book. To help you do this, a few topical questions are given below.

(1) (What-question)

What is Science?

(a) If you know any definition of 'Science' state one or two.

(b) Name the subjects which are considered to belong to the discipline of science and (2) which to non-science.

(1)Science Subjects	(2)Non-science Subjects
____________	____________
____________	____________
____________	____________
____________	____________

(2) (Illustration-Question)

(a)Give a few examples of those activities which are recognised as (1) scientific, and (2) which as non-scientific activities.

(1) Scientific activities	(2) Non-scientific activities
____________	____________
____________	____________
____________	____________
____________	____________

(b) (1) Give the names of a few scientists,
(2) What they have done and (3) When (year(s)/century).

(1)	(2)	(3)
____________	____________	______________
____________	____________	______________
____________	____________	______________

(3) (Questions on one's area of interest)

(a) Name the science discipline or subjects of your interest.

____

(b) Recall a few words/concepts belonging to that discipline/ subjects?

________________ ____________________
________________ ____________________
________________ ____________________

A1 (v) **Skimming**

Skim the passage taking down notes, as usual.

(a) Key terms found in the paragraphs

P. (1)______________________________
(2)______________________________
(3)______________________________
(4)______________________________
(5)______________________________
(6)______________________________

(b) Activities and (c) scientists referred to in the passage.

(b)________________
(c)________________

(vi) **Setting up Expectations for the book**

Expectations have to be set up for reading a 'book' also. You have to set them up according to the purpose of library reading. The purposes may be (a) to collect the latest (:new or additional) information on a topic, (b) to verify the authenticity of an information, (c) to understand a new information (which the teacher may have taught) with better clarity and to take notes, etc. Set up your expectations based on (a) your purpose,

(b) pre-reading orientations for the 'Introduction' and (c) knowledge gained through 'skimming'. (A set of questions to which I expect the book to provide the answers are given below for guidance)

(1) On what topics (or disciplines) is the book likely to provide new information?
(2) What new relationships (or perspectives) the book is likely to make of things I know already?
(3) What are the topics which I am likely to understand better by reading this book?
(4) State if the features of the presentation (illustrations, analogies, worked out examples, etc.) appear interesting and easily understandable.

(For your guidance blanks are given under each paragraph to make a note of these items).

Topical terms/words (known) : ____________
(new) : __________
Relationships/perspectives : ______________
Special features charts, etc. : analogies,:_______________

(vii) **Evaluations**

Read the 'Introduction' reciting what you have learnt at the end of each paragraph (blanks and guidance for filling them are given). After you have completed reading, answer the questions given under A1/Vi and draw conclusions on the usefulness of the book towards

(a) offering new and additional information/knowledge
(b) offering new perspectives
(c) offering better scope for easy comprehension and note-taking (for easy retrieval).

A2. ('Introduction' to the Book 'Science' by Pomery H.John)

The Scientific Method

1. As you read these words, men, women and youngsters would be doing strange and exciting things all over the world and even out of it. A biologist is swimming in a tropical ocean taking photographs of some brilliantly coloured fish, but keeping a wary eye out for sharks. Another man, an astronomer sits at a telescope on top of a lonely mountain carefully measuring the temperature of the planet, Mars.

____

____

____

____

2. A group of engineers are at the controls of a large radio telescope, a great metal saucer more than 80 feet in diameter. They are using it to collect radio signals from star systems many trillions of miles and millions of years away. Another man looks through a microscope as he slowly and carefully cuts out a tiny part of a single living cell. He is preparing to transplant it into a cell, which has been poisoned by radiation. Other men are studying photographs of the earth which have just been taken by a television camera in a satellite hundreds of miles out in space. They are arguing about whether or not a particular bank of clouds will develop into a hurricane and whether they should warn the islands in the area.

____

____

____

3. In other places, people are doing things which seem to be quite ordinary. A housewife tastes some soup she is making and decides that it needs a little more salt. She puts a couple of pinches, stirs the soup, and tastes it again. Now it is just right. A man gets into his automobile and turns his key in the ignition switch. Nothing happens. He thinks about the car's symptoms and history and then he calls a garage to have them bring over a new battery for his car.

____

____

____

4. To us not one of these people seems to have any direct connection with any of the others. Is there a relationship, some thread running through all these activities? This book will try to show you what the connection is. Sometimes we call it "the scientific method". Sometimes it is called curiosity about the way the Universe works. Sometimes it is thought of as just common sense. It is all of these things and a little more. It is a way of thinking about the world in which we live, a way of asking questions.

____

____

____

5. It is a way of looking for an answer and not necessarily accepting the first one that comes along. It is a way of trying to put various pieces of information together to see what they mean, to see if there is a general pattern to the way that things happen, just as a detective puts clues together to solve a crime. It is the ability to change your mind if you have to when you find a new fact which does not fit into your idea of what the pattern is. People used to "know" that the world was flat and that the sun was a hot ball a few hundred miles away. But when new facts were discovered people had to change their patterns of thinking. We will have to be able to do so too.

____

____

____

6. In other words, this is a book about science and about the people who use it to solve many kinds of problems. There are so many kinds of science today and so many new kinds coming along, that this small book can hardly be more than a general road map. It will try to show us where we are in science and where we are probably going.

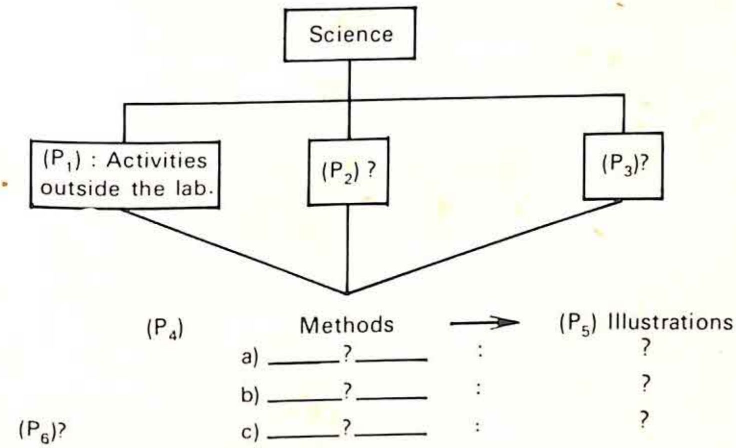
A3. Read paragraph 5 and answer the following questions.

1. State the reference or meaning of the following words in the given context.
   (a) the first one (l_2) (b) they (l_3),
   (c) their (l_9), (d) new facts (l_8),
   (e) we (l_9), (f) so (l_{10}),
   (g) people (l_9),

2. Rewrite the following statements in your own words.
   (a) (12) It is a way ___ to solve a crime.
   (b) (17) People used to _____ patterns of thinking.-

A4. Post-reading Review and Conclusion

1. Describe how the writer defines "Science".
   Do you agree with this defintion? Give reasons.
2. Describe the illustration if any, given by the writer to estimate the "effect" of Science on society.
3. (i) Give sub-titles to each paragraph and
   (ii) Indicate the overall relationship between each paragraph in the form of a chart or diagram. (A model is given below).



4. Answer the questions given under A1 (v) and (vi) and evaluate the usefulness of the book for your purpose.

Session B: *Discourse Logic and Coherent Thinking*

Understanding the Illustrations and conclusions

B1. Rewrite the following statements replacing the italicized words with suitable *non-technical* and *concrete* (as against technical and abstract) words, which are suitable for a general audience.

1. A biologist is swimming *in a tropical ocean* taking photographs

of some coloured fish, but *keeping a wary eye* for sharks.

2. Another biologist cuts out a tiny part of a single living cell and prepares to *transplant it into a cell* which *has been poisoned by radiation.*
3. The Bunt disease can be *prevented by dressing* the seed with a suitable *fungicide.*
4. Man may *resemble* a rat in certain respects; however, he is different in some important respects. He can be *educated* to grow beyond *the range of instincts* and *to evolve into a higher being;* but the rats cannot be.

B2. Sets of statements with pre-suppositions and implications for action are given below. Answer the questions that follow.

(i) A biologist is swimming in a tropical ocean taking photographs of some coloured fish but keeping a wary eye out for sharks.
- (a) Is the biologist taking pictures of the sharks?
- (b) Why should he keep a careful watch for the sharks?

(ii) Scientists are studying photographs of the earth and arguing about whether or not a particular bank of clouds will develop into a hurricane and whether they should warn the islanders in the area.
- (a) What do the photographs depict?
- (b) Why should the islanders be warned?

(iii) A man gets into his automobile and turns his key in the ignition switch; nothing happens. He thinks about the car's symptoms and history and then he calls a garage to have them bring over a new battery for his car.
- (a) What should happen when the key is put in the ignition switch and turned?
- (b) What does he understand by thinking about (:reviewing) the car's symptoms and history ?

(iv) People used to "know" that the world was flat and that the sun was a hot ball a few hundred miles away. But when new facts were discovered people had to change their patterns of thinking. We will have to be able to do so too.

(a) What does the word 'know' in the text mean? What was the pattern of the earth, sun, etc., which the people of 15th and 16th centuries believed to be true?

(b) What is the new pattern of thinking of our times and who brought about this?

B.3. Sets of jumbled statements are given below; identify the functions of the statements and re-organise them so as to make coherent sense. (Identify the form of logic underlying each passage).

(i) (a) A group of engineers are collecting radio signals and analysing them for knowing more about the solar system.
  (b) Scientists are engaged in activities which may increase our knowledge of Nature.
  (c) Physicists are studying the photographs of clouds to know if they indicated a 'hurricane'.
  (d) These activities involve careful analysis, synthesis and verification.

(ii) (a) This activity involves analysis, trial and verification and hence may be recognised as a scientific activity.
  (b) Now she tastes it again.
  (c) A housewife tastes some soup she is making.
  (d) Then she puts one or two pinches of salt and stirs.
  (e) Hence cooking should be treated as a scientific activity.
  (f) She discovers that it needs a little more salt.

(iii) (a) Scientific discoveries require us to change the pattern of our thinking.
  (b) Now we know that by dividing the atom to sub-atomic particles we can produce quite a lot of energy.
  (c) Galileo's discovery that the sun was at the centre and not the earth changed our understanding of the universe.
  (d) Rutherford's experiments disproved the earlier thinking that atom was indivisible.
  (e) Some people are able to quickly change their concepts and some are not able to change their beliefs.

B4. Fill in the blanks with suitable forms of the words given in brackets.

(i) Scientific method is a way of ___(think) about the world in which we ____(live). It is a way of ____(ask) questions. It is a method by which all pieces of information relating to a problem may be ____(collect) and ____(study) carefully.

(ii) Mendel ___(observe) the characters of many parents and their off-springs and ____(draw) inferences about the way parental characters _____(distribute) among their children.

(iii) Air, like water or other fluids, ___(has) weight and volume. On every square inch of our body the air___(press) with a weight of fourteen pounds and this weight ____(has) to be _____(push) aside when we __(walk) or ______(run) just as water_____(push) away by a swimmer.The air ____(resist) our efforts to push it aside and this ____(call) air resistance.

B5. Complete the missing portions in the following sets of statements. (Identify the logic underlying each thought-unit).

(i) Sodium hydroxide is soapy to touch and turns red litmus to blue. Potassium hydroxide is also_______. These chemicals which _____are known as alkalis.

(ii) Lemon is acidic to taste; orange is also acidic. Generally, _____ have __ properties whether they are sweet or not.

(iii) Plants require trace elements like Zn, Cu, Mb, Fe, etc. Humans also ___for their growth. Every living organism___.

(iv) Experiments in biology are carried out in U.S.A. These _____ in U.S.S.R. and other countries also. A number of experiments in physics, bio-_____, _____, bio-chemistry, agriculture, are carried out in different parts of the world. Thus, it will be seen that 'Science' is ____, and its methods are _____.

Session C: *Description/Definition of Relationships*

C1 : The topic of the passage is "Transplanting of seedlings". Recall words and concepts associated with (the words in) the title. For your convenience, a few clues are given.

(i) Seedlings: Size :
age :
purpose :
place :

(ii) Transplanting of Seedlings
What :
When :
Where :
By Whom :
Other factors :

C2. Complete the following graphs using the information available in the given passage.

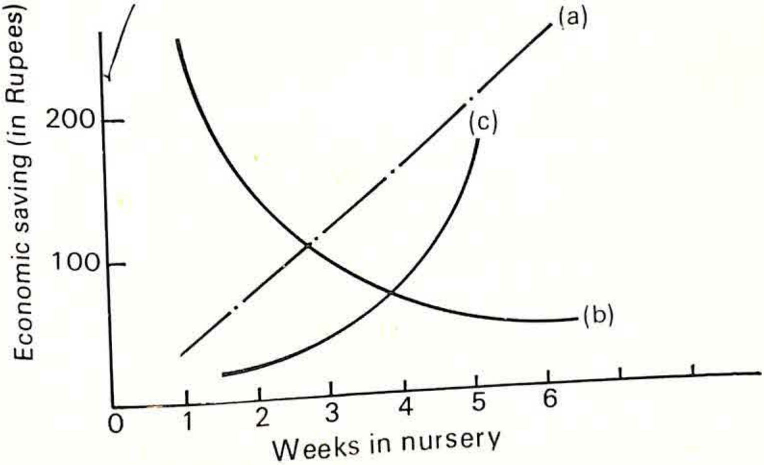


Fig. 1. Assumed relationship between the two factors (Show the relationship by ticking which of the curves is assumed)

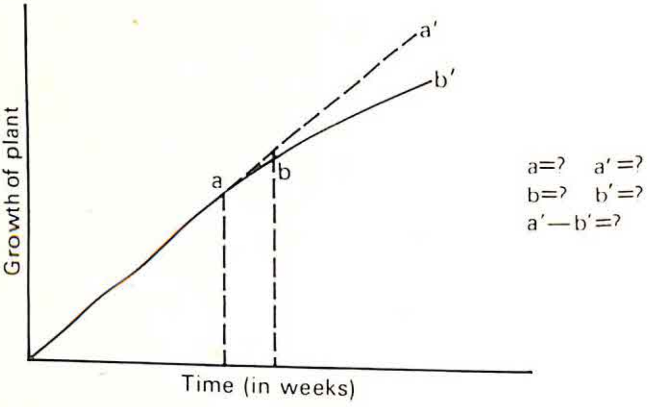


Fig. 2. Time, Transplantation and Growth

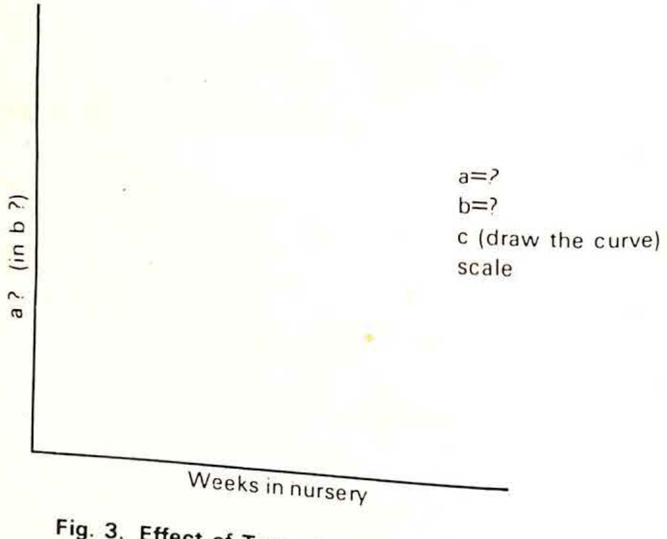


Fig. 3. Effect of Transplantation Shock

Transplanting of Seedlings

If it is assumed that an economy is achieved by retaining plants in a nursery during the early phase of their lifespan, then it is obvious that the longer the plants are maintained in the nursery in a productive state, the greater will be the economic saving. There are, however, two factors which limit the period during which plants can be held in a nursery:

1. With the closer than field spacing of nursery plants, competition for light and root space will check growth when the plants become large.
2. The larger the plants become in the nursery, the more difficult it will be to handle and transplant them.

To understand more clearly the question of correct timing in a nursery and the consequence of planting out late, we may refer to Fig. 1.2 which shows the course of development of a plant in the exponential phase of growth that would be appropriate for the nursery and early field stages of planting.

If nursery and planting out operations are well carried out, (at a point of time 'a' in the figure) there should be both a minimal disturbance to the course of the development as expressed by this curve, and a minimal departure of the actual growth curve (a-b) from this theoretically optimal one (a). In practice, of course, timing is not the only factor which can cause a loss of development; another is transplanting shock. In this respect, polythene bag or container nurseries, as explained, are superior for planting shock is minimised. A well-timed polythene bag nursery will give, therefore, the best possible rate of development.

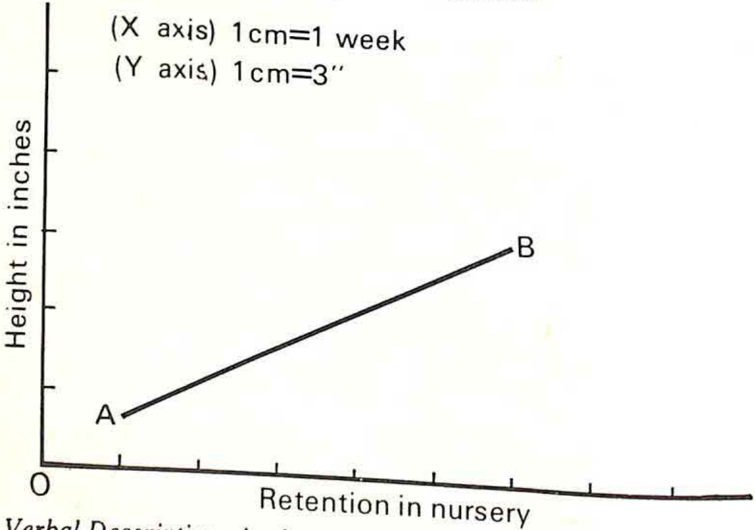
C.3. Statements consisting of condition and results (:consequence) are given below. Complete the missing portions with reference to the information in the third paragraph.

1. If the seedling is planted out (transplanted) from the nursery after the optimal time ___.
2. ____, there would be very little effect on the growth of the plants.
3. ______, the plants may suffer from an effect called transplanting shock.
4. If the seedlings are subjected to transplanting shock _______>.
5. If _____, the seedlings would not have any transplanting shock at the time planting out.

C.4 Statements of relationship between certain changing factors are given. The relationship may be one of change in the same direction (i.e. increase-increase or decrease-decrease) or in the reverse direction (increase-decrease). Complete the missing portions with reference to the information in the second paragraph (The blanks may take one or more words).

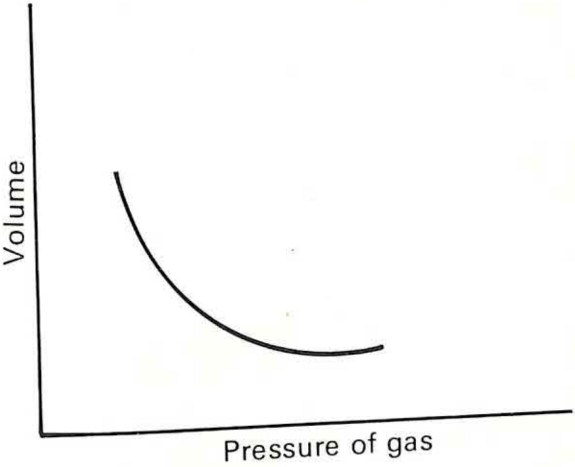
1. The *closer* the spacing of seedlings planted out ___ the number of plants in an area of 1 sq. metre.
2. If there are *more* plants in a given area then there will be ___ competition among them for water, nutrition and sunlight.
3. If the size of the seedling is *large* the problem of planting them out without shock ________.
4. The *smaller* the size of the seedlings _________ will be the time required for transplanting them; however ___ will be the effect of shock for the plants.
5. The ___ the delay after the due time for transplanting, there will be the difference between potential growth and real growth.

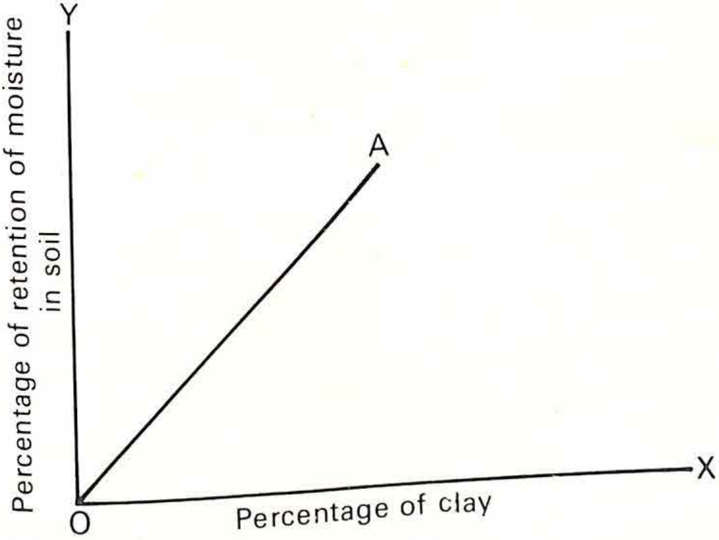
C.5. Read the following graphs and describe the relationship verbally. An example is given for your convenience.



Verbal Description: As the period of retention in the nursery increases (so) the size of the seedlings also increases.

Fig. 1. Development of the Seedling in the nursery





Session D: *Integrated Grammar and Writing a Popular Bulletin*

D1. The cloze text in D3 is a popular bulletin on "Manathakkali" (solanum nigrum), the leaves of which are considered to contain many minerals and vitamins. Its Vit. B2 content is high, and hence the leaves, taken in the form of curry or juice, are found to cure a person from the problems caused by Vitamin B deficiency. This plant grows profusely like weed, and its fruits have been found to attract the old and the young alike.

D2. For writing a popular bulletin, information has to be selected and organized in a particular form. Only then the readers will get persuaded to act upon the suggestion made in the bulletin. 'A popular bulletin is an important communication form for successful Agricultural Extension Communication'. Selection of suitable information has to be done according to the needs of organizational structure for successful communication. (The structural organization and the functional needs of each unit are indicated in the margin for your benefit).

Rewrite the passage after filling in the blanks with appropriate words.

Rich in Riboflavin- Manathakkali (A popular bulletin)

Lead (1)
known information unsolved problem
purpose: to motivate reading)
Development (2)
(Associating the unknown/new information with known information)
purpose: (easy understanding)
content (3)
(new knowledge)

Many weeds come up in the garden after the rains, some of them persistent and competing with the vegetable crops we raise. It is but necessary to remove these plants but can do well to watch whether there are any worthwhile plants which are of nutritive value_1__ of these plants may be the "Manathakkali" botanically Solanum nigrum ___2_____ to the same family as the tomato and __3__ the plant has leaves, small bundles of which __4__ sold in the market. There is a ready __5__ for it as it is well known for __6__ relief it gives against sores in the mouth __7__ tongue.

The analysis of this green according____ 8___National Institute of Nutrition, Hyderabad, shows that for__9__100 gram it contains 82.1.g. moisture, 5.9g._10__ 1.10 g fat, 2.1 g minerals and 8.9 g carbohydrates. The _ 11 __ value of this green leaf is 68 calories _12__ the mineral content is made up of 410 mg _13__ calcium, 70 mg phosphorous and 20.5 mg iron. Manathakkali is__14__best known for its richness in riboflavin (vitamin B2) __15_ 0.59 mg for every 100 gms a high value excelled _16___by cow's milk in the 664 food commodities __17_ by NIN.

Reinforcement (4)
new associations
purpose: (memory)

Riboflavin deficiency is widespread in the____18____particularly in areas where rice is the staple._____19____common green grows in the gardens without any____20_____care. It can come handy as the source____21____this essential vitamin B2. This is particularly important ____22____the deficiency of this vitamin is reported to____23____a kind of cracking in the corners of______24___mouth. In addition, the leaves contain 0.9mg of_____25____and 11mg Vit. C as reported by NIN.

Closure (5)
(practical way of
application & perception of the
'value' for
adoption)

It____26_______worthwhile to take good care of the plant____27____ it occurs in gardens. Its fruits may be_____28____into a sort of pickle with salt for____29____use or dried and use as preserved pickle____30____cuttings may be cooked like greens for consumption. The plant introduced once in any garden will multiply easily as the seeds are self-sown. There is no readymade Vit B and that too in large quantities as in Manathakkali.

(From "The Hindu" dated April 8, 1978)

(clues)

1(o), 2(b), 3(b), 4(a), 5(m), 6(t), 7(a), 8(t), 9(e), 10(p), 11(e), 12(a), 13(o), 14(h). 15(c), 16(o), 17(1), 18(r), 19(T), 20(s), 21(o), 22(a), 23(c), 24(t), 25(n), 26(i), 27(w), 28(p), 29(i), 30(L).

Session E: *Listening Comprehension and Note-making*

A biographical sketch on "Madame Curie"

E1. Recall words/concepts you know about Marie Curie and her work before listening to the tape.

E2. Listen to the talk and write down words/statements you are able to recite and review what you have listened to. Write in the form of hints organising in chunks of thought-units.

E3. A few hints are given below based on the talk. Develop this into a talk forming one or two statements around each word/statement in the given hints. You will note that the hints follow the sketch closely and are given as four thought-units (each thought-unit is marked with a musical tune).

Maria______born in Poland_____Family background employment to support her family and to pursue University education_________left for Paris.

At Paris_______working in a school______studied hard ______ Masters degree in Mathematics in 1897 _______ Second rank in the University _______ married Mr. Curie a scientist.

1895________turning point in the development of modern Science______Rontgen discovered 'X' rays______Becquirrel______more powerful rays from ore _______ Pitch blende _______.

Madam Curie_________a Scientist's qualities______ patiently, methodically, working alone________pitch blende broken to pieces______ a small piece _______light in the Photoplate _______ from where?______ discovery of the Radio-active Radium__________light that lights the darkness________more powerful than ordinary light_______.

JET PLANES WORK LIKE THIS

MODULE-10: DEDUCTION AND ANALOGY

Session A : *Evaluating A Book : The Chapter Headings, Index and Sample Reading*

A1(i) The book describes how Frank Whittle attempted to solve the 'problem' of aeroplanes, and in the process, conceived the idea of the jet engines. Further developments have come up while attempting to solve other problems. As a student of science, you should learn to raise/identify problem-posing questions and to become innovative in your thinking.

(ii) **Identifying the Orientation of the Book**

(a) The following materials are brief representations of the Chapter Headings, Index and sample materials of the book, "Jet Planes Work Like This" written by John W.R. Taylor. As a student, you may have to read quite a number of books and collect literature on your own. For this, you should know how to select the right book for your reading. In Module 9, you learnt how to identify the suitability of a book to your needs by reading the introduction. In this Module you will learn to evaluate the usefulness of the book to your specific needs (:Reading expectations) by going through (1) the Chapter Headings, (2) the Index and (3) sample reading of selected topics.

(b) *Reading Expectations* : Let us assume you have been asked to collect information on the following topics in the library.

(1) The working of the Jet engine
(2) Swept wings
(3) Delta plane

(c) *Pre-reading orientation:* Recall to your mind what you know already about the aeroplane and the jet plane. (For your convenience, a few headings are given below)

Aeroplane	Jet plane

Principle __________ __________
Inventor __________ __________

Parts __________ __________

Fuel __________ __________

Any other information __________ __________

(d) *Reviewing the suitability of the book:* Read the 'blurb' (if any) and the 'Introduction' of the author and review if the book (:contents and language) is written to serve your needs. (For your convenience, a few questions are given for reviewing; positive answers to these questions will indicate the suitability of the book to serve your needs).

Questions for Reviewing

Answer Yes/No to the following questions after reading the 'Blurb' and the 'Introduction'.

1. Is the writer and publisher well-known for their works in this field?
2. Is the book likely to provide the latest information on the area of your interest?
3. Is the language of the author simple enough for you to understand?

(e) *Blurb :* John W.R. Taylor is a well-informed writer. He writes in simple and clear English for general readers. Some of his other well-known books are: Great Moments in Flying, Helicopters Work Like This, and Rockets and Satellites Work Like This.

(f) *Introduction :* School students of science will be interested to know how the idea of a jet engine came to a young man and how he managed to make it real. The first jet engine has been improved in many ways. A scientist keeps on improving over what has been achieved. Whenever 'problems' arise, the scientists attempt to solve them and in this process, new knowledge and new innovations arise. The development of jet planes from the aeroplanes and their likely further developments are interesting to read. These are described in the following pages for the benefit of students of science.

A2 (i) Now read (a) the 'Chapter Headings' (b) the Index (c) the pages where the items of your interest (refer ii b above: reading expectations) occur in the book and then (d) evaluate the usefulness of the book by answering the following questions.

(ii) **Questions for general evaluation**

Answer Yes/No to the following questions

1. Does the book appear to give a comprehensive coverage of the subject? (based on your reading of the Chapter Headings)
2. Do you find all the words/terms (in the Index) for which you are required to collect information?
3. Does your reading of the pertinent places of occurrence of the 'terms' (vide ii b) appear to give you useful information?
4. Do you find the illustrations/figures (if any) to be very useful?

(iii) Chapter Headings: ***CONTENTS***

Chapter 1 : Who Invented the Jet Engine
Chapter 2 : How a Jet Engine Works
Chapter 3 : Putting Back the Propeller
Chapter 4 : How is a Turbine Harnessed to Drive a Propeller ?
Chapter 5 : New Shapes in the Sky
Chapter 6 : The Future for Jets

(iv) **Index** (Linewise)

____
Aircraft (Aeroplane) - 10
Chemical fuel - 77
Compressor - 27
____
Delta wings - 69
____

Reaction - 4,17,14
____
Rocket Engine - 6
____
____
____

Gas Turbine	- 53	______	
______		______	
		Swept wings	- 62-63
______		______	
Goblin Mariettax	- 38	Turbofan	- 67
______		______	
Newton, Sir Issac	- 1	Turbojet	–41,42
______		Turboprop	--55,80
Pisto Engine	- 9,49,57,75		
Propellor	-17,18,41 44,49		

(You may find this in the last few pages of a book. The Arabic numbers will indicate the pages; but in our illustration they denote the lines. The 'terms' sometimes may be found under different heads, e.g., Jet engine/Engine, etc. Sometimes a term may form part of a chapter heading or sub-heading also, e.g., chapter 2: "How a jet engine works".

You must look up all related references).

(v) **The Book:** (excerpts are given)

Jet Planes Work Like This

Chapter 1: Who invented the Jet engine

Sir Isaac Newton deserves some credit because in addition to 'discovering' the law of gravity when an apple fell on his head -- he stated in his Third Law of Motion that "To every action there is an equal and opposite reaction." Written like that, it sounds rather dull and uninteresting. Yet Newton's Third Law of Motion not only forms the basis of all jet engine design and operation but explains why rocket engines are able to send spacecraft speeding through space to the moon and planets of our solar system.

In fact, a jet or rocket works in just the same way as a piston-engine and propeller; by throwing air rearward the aircraft is propelled forward by (10) reaction in accordance with Newton's law. How? Well, just imagine that you are standing face to face with someone on an ice-skating rink and decide to give him a push. He will start to move backward and so will you. That's reaction.

(problem) 15 It was obvious fairly early in the aeroplane's life that it would never be able to fly at great speeds or heights so long as it was tied to a propeller. Above 30,000 feet the air is so 'thin' that a propeller cannot get a good bite on it; and there are limits to the rate at which conventional propellers can be turned to give higher speeds. It was in 1928 a young cadet at the Royal Air Force College, Cranwell wrote a thesis on 'Future (20) Developments in Aircraft Design' and drew the first design for a jet engine, an engine without a propeller. His name was Frank Whittle.

Chapter 2 : How A Jet Engine Works

What happens is that air is taken in at the front of the engine and fed straight on to the compressor which at top speed rotates at more than

1,000 revolutions per minute (r.p.m). The air, now compressed to above 40 lb per square inch, is flung outward by the curved vanes into the combustion chambers which surround the engine. There fuel burners spray burning kerosene into combustion chambers to form a mixture with the compressed air, raising the temperature and increasing the energy (30) of the gases so much that they expand at high speed past the blades on the turbine to escape from the rear of the engine. This makes the turbine rotate so fast that it develops more than 6,000 horsepower.

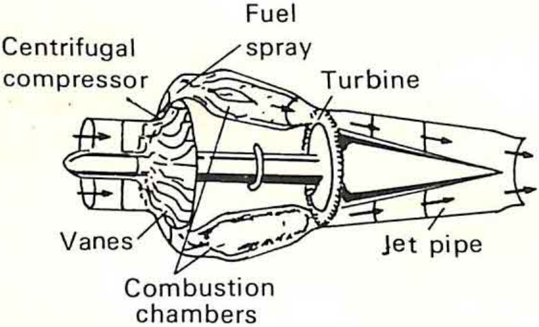


Fig. 1. Cutaway drawing of Goblin turbojet

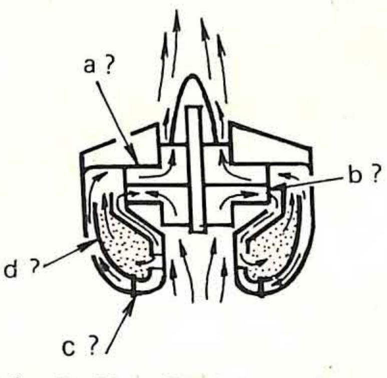


Fig. 2. Von Ohain's engine, as fitted in the He 178

After passing the turbine blades, the gases still possess considerable energy and are led through a tail pipe to propelling nozzle, where they are ejected at over 1,000 m.p.h. Running flat out, a Goblin swallows 100 tons of air every hour, and the ejection of this weight of gas at such a high velocity gives it a forward thrust of up to 3,500 lb. By 1941, this theory of turbojet was converted into a successful aircraft power plant.

(problem)

Chapter 3 : Putting Back the Propeller

A turbojet is not nearly so efficient at (40)low forward speeds and low altitudes as an engine driving a propeller. As a result, a turbojet aircraft needs comparatively long take off run, and some of the (problem) airfields used by the short-range airliners of today would be too small. At first, a jet aircraft also took longer to slow down after landing because it had no device like the reversible pitch propeller of a piston engine, the blades of which can be twisted to throw (solution) the air-flow forward instead of back, and so form a highly efficient brake. And so the propellers were put on the front of the gas turbine engine. In exchange for speed we use very much less fuel, get increased versatility, because the propellers enable a turboprop aircraft to use runways of the same (50) length as a comparable piston engine aircraft and a much quieter engine.

Chapter 4 : How is a turbine harnessed to drive a propeller?

Chapter 5 : New Shapes in the sky.

Problem-
Soln.
problem-
Soln.

By about 1945, designers were beginning to fit thinner wings to their high speed aircraft to postpone the shockwave trouble. At about the same time, wide tunnel experiments showed that still higher speeds were possible in complete safety if wings were also swept back and these discoveries came in time to influence the design of all but the earliest types of jet aircraft.

(innovations)

Chapter 6. The Future for Jets

In the Mirage III-V, lift jets were used to provide the vertical thrust for take off. Once in the air, a large turbofan mounted conventionally in (60) the rear fuselage, was opened up to propel the aircraft forward.

> As speed increased, the fixed delta wings provided more and more lift until, eventually, it was possible to shut off the downward pointing jets and fly in the normal way. Vertical landing was achieved by reversing the process. One day jet 'lift' may enable airlines to dispense with the need for long runways.

Any one of these ideas might revolutionise flying in the years ahead, and there are plenty more, ranging from the simple substitutions of chemical fuels like pentaborane for the present kerosene and wide cut gasoline giving greatly increased power per pound of fuel, to the inevitable advent (70) of the atomic engine, which will almost certainly be used in the form of a jet or turboprop. Nor should we forget the rocket which is after all just another kind of jet engine.

Fuselage	Place where passengers sit
Ice-skating rink	Ice-floor for skating
Nozzle	Nose of a plane
Shock wave	While flying at the speed of sound (:760 mph) air vibrations affect the wings
Turbine	An engine which works by using the expansive nature of a burning gas
Versatility	Ability to change the speed easily

A3. Read pertinent areas and take notes in the form of hints/drawings.

(i) What are the principles used in (a) the combustion chamber, (b) Vanes, (c) swept wings and (d) Delta-shape for the planes.

(ii) (a) Contrast the functions of a propeller in (a) an aeroplane and (b) the jet plane. (b) In the same way, tabulate the differences between (a) an aeroplane engine and (b) a jet engine.

(iii) Describe (a) how a jet plane can be converted into a lift rocket and (b) how it can be modified to enable it to land vertically.

A4. (i) Write a long article (of two pages making necessary drawings) on using jet planes for transporting goods between cities.

(ii) Write a long article (of two pages making simple drawings/ pictures) on the problems likely to arise in using jet planes for transporting people between towns within a State.

Session B : *Discourse Logic: Deduction and Analogy*

1. Fill in the blanks with expressions suitable for general (:non-technical) readers from among the words given in brackets.
   (1) The jet plane is______forward by the pressure of its exhaust gases (moved, pushed, propelled, impelled).
   (2) In the jet plane the piston engine throws air backward so that the aircraft is pushed_____(rearward, frontward, forward, to the front).
   (3) In the combustion chamber of the jet plane, the fuel burners spray burning kerosene in order to_____a_____the temperature and thus to____b_____the energy of the exhaust gases (raise, improve, enhance, increase, elevate).
   (4) Owing to heat, the gases expand; these expanding gases are then compressed and_____through the tail end of the jet plane (emitted, expelled, ejected, forced out).

2. Complete the following statements with expressions suitable for general readers

   (i) Jet planes of early models took a longer time to slow down while landing________
      (a) as they did not possess a reversible pitch propeller.
      (b) because they had no device to control the forward motion.
      (c) owing to the want of a mechanism to arrest the speed of the exhaust gases.

   (ii) The propeller was put in the later model of jet planes______
      (a) so that it may help to throw the air forward to reduce the speed of the jet plane.
      (b) in order to arrest the incoming flow of air and thus to act as a break.
      (c) so as to serve as a reversible pitch-propeller and stop the

inward air flow.

(iii) ________the jet planes fly at great speeds without the problem of sound-wave shocks.

(a) As the wings are slanted towards the back
(b) In the context of swept back wings
(c) Inasmuch as the wings are slanted backwards

3 Fill in the blanks with suitable referential words like it, he, its, etc.

Spartan Plant

(i) The people of Sparta are remembered for certain virtues. _______a______had strength to endure suffering and punishment with a smile.______b______capacity to resist unfavourable circumstances and to finally succeed was great. Similar to_______c_______Spartans_____d________is a crop which can withstand unfavourable circumstances like drought and poor soil _____e______is the Surat Senna, a small plant from which ____f____can extract glucose as_____g____leaves contain amounts of glucose. The plant grows well in dry tracts.

Forest Ecology

(ii) In the forest life, every individual, tree or plant tries to obtain for_____a______offspring and______b______the nourishment necessary for life______c______leads to the struggle for life. Above ground,______d_____resolves itself mainly into a trial for light. Underground,_____e_____goes on in the soil for water and soil nutrients. Notwithstanding______f_______struggle for existence,____g___is also friendship and cooperation between the trees, plants, herbs and grass______h____is this struggle and cooperation which results in a kind of balanced population among all the members of the forest life.

4. Rewrite the statement reorganizing (:re-ordering) the italicized words according to the logic of the discourse.

(i) An astronomer sits at a telescope a) *carefully measuring* b) *on top of a lonely mountain* c) *the temperature of the planet Mars.*

(ii) In Einstein's theory we observe a synthesis of all the earlier concepts like the a) *Quantum theory*, b) *Newton's* cosmogeny, c) *Maxwell's Co-ordination of light*, d) *Faraday's Electricity* and e) *Marconi's Wave theory.*

(iii) In pre-historic times people should have observed some relationship between the sun, moon and stars and then set up the temporal units like a) *a month*, b) *a day*, c) *a year*, d) *an hour* and e) *a week*. In present times we have probably refined it further to include units like the solar day and the light year.

(iv) Protein is a constituent of living matter in both a) *vegetable* and b) *animal kingdoms.* Every form of life c) *virus*, d) *mice*, e) *bacteria*, f) *plants*, g) *insects* and h) *men* contains proteins of different kinds. However, all these proteins are synthesised by amino acids.

5. The following texts carry statements of generalisations (:principles) and particular examples. Some portions of the statements are missing. Restore the missing portions according to the logic (deductive and analogical) of the discourse.

(i) All living beings have some organs to perceive gravity and maintain stability. The nerve ends floating in cochlea ____ a _____us with the sense of gravity. Even the marine creatures have organs called statholiths by which____b____. Therefore the trees and plants also____c___, Only then they could sense the gravity,_____d_____tall and straight and____e____.

(ii) According to Edward Hyams, crops, cultivated plants, are as much man-made as are the stone arrow heads, the stone mill and the_____a____of ancient times. ADT6 rice______b ____ in Tamil Nadu even before the introduction of IR. 8 from IRRI. Indeed without these_____the later rice crops like Co. 43 would not have come into existence to serve our local needs.

6. The following texts carry statements of generalized comparisons and inferences. Some portions are missing. Restore them according to the logic (analogy) of the discourse.

(i) Dahlias and chrysanthemums flower very well in the Nilgris.

They____a_____in Kodaikanal because it is a ____b____ enjoying similar_____c______.

(ii) Eggs and seeds have similar functions; they serve______a_____ However, their constituent proteins_____b______. Hence not all eggs and seeds may be used for purposes of human consumption.

(iii) The common cold is like a traffic constable. Removing the cold germ would be like____a____. If these signals, the constables and red lights are not there, there will sure be head-on collisions and crashes. Similarly if the cold germs______b_____then the person____c_____to caution him/her of impending problems of health.

Session C : *Technical Article : Tables and Discussion*

C1. (i) A technical article has a specific form. It has the following parts organized in a particular order (given below). The parts are (a) Abstract, (b) Introduction (and Review of Literature), (c) Materials and Methods, (d) Discussion, (e) Conclusion and (f) References. There may be a number of figures/diagrams and tables in all the parts. The following article, "Some Factors Affecting The Site and Pattern of Leaf-cutting Activity in the Ant, *Alta Cephalotes*" is written by Barrer, P.M. and Cherrett J.M. and taken from the Journal of Entomology, London. The purpose of their research is to find out (a) why ants cut only certain leaves and (b) what types of leaves attract the ants. In short, the researchers carried out experiments to find out the relationship between the features (physical, chemical, etc.) of leaves and leaf-cutting (:eating) activity of the ants.

(ii) Before reading the passage, recall what you may know on the topic. A few questions are given to guide you to do this.

(a) Do ants cut the leaves of all plants and trees?
(b) Do they cut any and every part of the leaf?
(c) What kind of leaves seem to attract the ants?

(d) Do ants cut leaves in any identifiable pattern?

2. Study the following figure and (i) describe what you may observe about the site and pattern of ant cuts on each one of the 15 leaves and (ii) draw, if you can, general conclusion (generalisation) from your observations.

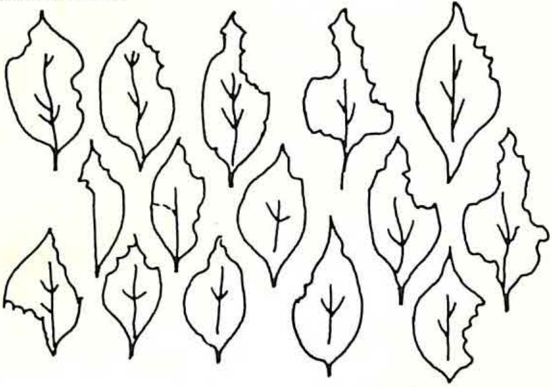


Fig 1. Ant cut on 15 identical leaves

(iii) Now study the pertinent area(s) and table(s) in the Article, check up your answers with them, and answer the following questions:

(a) Have all the leaves received same number of cuts? Are there variations? (Illustrate by referring to particular leaves)

(b) Have the ants cut the leaves on identical parts of the leaf? (Illustrate by referring to particular leaves)

(c) Would you say that leaves once cut by an ant seem to attract more ant-cuts? (Illustrate)

(iv) Read the Title to the given Tables and identify (a) the conditions that are varied (:variables) and (b) the conditions that are kept unvaried (:control) between the experimental items.

Table 1. (a)________________ (b)________________

2. (a)________________ (b)________________

3. (a)________________ (b)________________

v. Read the article and answer the questions that follow.

C. 2 Some Factors affecting the Site and Pattern of Leaf-cutting Activity in the Ant, *Altta cephalotes.*

Introduction

Materials

&

Methods

Preliminary experiments were undertaken to discover if a heterogeneous pattern of attack could be observed under standardised laboratory conditions. Fifteen large cherry leaves were selected for similarity in appearance and were presented together on a grid to the ants. The number of ant cuts on each leaf was noted at intervals of 10 minutes. In Table 1, Morisita's Index of Dispersion is calculated for each group of recordings. The distribution of ant cuts over the 15 leaves differs significantly from that to be expected from chance showing significant accumulation of cutting throughout the period of the experiment (vide Fig. 1.). Certain leaves (e.g. leaf No. 10, replicate 1) also show aggregation of cut in time, when the data are converted to ant cuts per 10 minutes.

Table: 1 The distribution of ant cutting activity over a group of leaves of similar appearance

Time after start of experiment in minutes	No. of ant-cuts originating on leaf															Morisitas Index of dispersion
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
10	1	0	0	2	3	0	0	0	3	1	0	1	0	1	4	1.63
20	2	0	0	4	5	0	2	0	6	8	1	1	2	1	5	1.62
30	4	0	1	7	9	0	2	0	6	9	5	1	3	1	8	1.52
40	4	2	1	10	9	1	3	0	7	9	7	1	3	2	8	1.36
50	6	2	3	13	9	1	5	0	9	10	9	1	3	2	11	1.37
60	8	3	5	18	10	1	8	0	11	10	11	1	3	2	12	1.41
70	8	5	8	21	13	2	10	0	15	10	14	1	3	2	15	1.41
80	8	5	9	24	13	2	10	1	15	11	16	1	3	4	15	1.40

Discussion : The leaves in the experiments summarised in Table I were selected for similarity in size and colour. It is assumed that identical points on either side of the leaf midrib possess closely comparable properties; so the general absence of mirror image cutting (leaf 7: fig. 1) supports the hypothesis that cutting sites include factors other than the physiological states of the leaves or portion of leaf. It is clear that leaves with early cuts attract more and more ant-cuts. The experiments described below were carried out in order to investigate these possibilities in greater detail.

Leaf Age :

C3. The number of cuts originated on the edges of leaves of different ages are compared in Table 2.2 Leaves on the stem became progressively older from leaf pair through to leaf pair.

Table 2: The effect on ant-cutting activity of differences in leaf age. Pooled data from 10 stems.

Leaf pair on stem	No.of ant cuts/leaf pair	Index of leaf area/leaf pair	X^2
1 (youngest)	68	1.0	79.97
3	98	2.2	38.16
5	77	2.7	2.18
7	45	2.5	3.86
9	30	2.7	18.91
11 (oldest)	17	2.9	37.76

Total $X^2 = 180.84$ with 5 d f.p. <0.001

(Discussion) It was observed that the leaves which were young (:No.1 to 5) attracted higher ant cuts and that the leaves which were older (No.7 to 9) got relatively lower ant cuts. A further group of experiments was undertaken to show whether this reduction in attractiveness was a property of chemical changes accompanying leaf aging. The experiments were designed to demonstrate the basis of the mode of action on the ant of any such chemical changes.

Table 3: The effects on subsequent ant cutting activity of smearing old leaf extract on young leaves. Pooled data from 7 pairs of leaves.

	No. of ant cuts orginating on		
Replicate	Extract smeared leaf surface	Unsmeared leaf surface	X^2
1	0	26	26.0
2	2	23	17.64
3	2	24	18.62
4	2	21	15.70
–	6	94	77.96

(Discussion omitted: the students are required to do it).

Another experiment was set up to find out the effect of smearing young leaf extract on old leaves.

Table 4: The effects on subsequent ant cutting activity of smearing young leaf extract on old leaves. Replicates 1-4 pooled data from 6 pairs of leaves; replicates 5-8 pooled data from 5 pairs of leaves.

	No. of ant cuts originating on		
Replicate	Extract smeared leaf surface	Unsmeared leaf surface	X^2
1	21	2	15.70
2	21	1	18.18
3	23	1	20.16
4	20	0	20.00
5	19	1	16.20
6	14	1	11.26
7	17	1	14.22
8	20	0	20.00
Σ	155	7	135.72

(Discussion omitted: the students are required to do it)

(Finally; the effects on the ants' cutting behaviour of smearing old and young leaves using quinine sulphate and sucrose solutions were carried out).
It was found that smearing of sucrose solution attracted ant cuts while that of quinine sulphate appeared to act as a repellent.

Conclusion

1. The young leaves of privet are significantly more attractive to the ants, *Altta cephalotes L.*, than the old, and evidence from other plant species suggests that this relative attractiveness of young leaves is a widespread phenomenon. The relative attractiveness of young privet leaves is partly due to the presence of attractive chemicals within the leaves. Old privet leaves probably possess qualities of actively repellent chemicals, which tend to counteract the influence of more favourable cutting stimuli.

2. Fresh ant cuts and other types of damage on a leaf increase the probability of further ant cuts occurring on the same leaf. Leaf cutting develops with an accelerating bias towards areas of the plant that are already being successfully exploited by the ants. Initially, this accelerating bias increasingly favours the more attractive regions of the plant, usually those with the youngest growth.

3. Ant-secreted pheromones are not responsible for the high attractive value of ant cuts, which is due partly to the increased availability of sensory information concerning the chemical composition of the leaf and partly to the physical geometry of the cut in the leaf. Barrer, P.M. and Cherrett, J.M. (1972) "Ant cutting activity on leaves" *Journal of Entomology*, London V47-Part 1 Oct,72 p15-27.

C4.Questions for Interpretation

Please indicate the most suitable answer from among the given choices and check your answers by reading the relevant areas again.

1. The cherry leaves selected for the experiment_____
   (a) were not identical in every respect.
   (b) were identical in every respect.
   (c) were similar in all physical aspects.
   (d) were similar only in appearance.

2. Over a period of time (say, at the end of 40 mts.) the total number of ant cuts in each leaf______.
   (a) show that some leaves do not get many cuts
   (b) show that the leaves cut in the first 20 mts. get more cuts.
   (c) are equal for all the 15 leaves
   (d) show a chance behaviour of ants on each leaf.

3. That the ants do not cut similar portions on both sides of the midrib (see fig.7) of each leaf indicates______.
   (a) that the identical points do not have similar chemical properties.
   (b) that the side not cut early is left uncut.
   (c) that the side not cut is not big enough for the ant to sit upon and cut.
   (d) that the side cut appears to attract further cuts.

4. The leaves on the top of a stem are _____.
   (a) young leaves (b) old leaves (c) progressively more and more young leaves (d) progressively more and more old leaves.

5. Leaf 10 in comparison with leaf 15 in Table 1 appears to show ___.
   (a) a steady increase in the number of ant cuts every 10 minutes.
   (b) some number of ant cuts in 10 mts.
   (c) a steady decrease in the number of ant cuts every 10mts.
   (d) do not bear any significant relationship with the number of ant cuts in leaf 15, per unit time.

6. The variable factors in table 2 are___.
   (a) young leaf and old leaf (b) area of leaf and ant cuts (c) age of leaf and area of leaf (d) area of leaf and stem.

7. The controlled factor in table 3 is ____.
   (a) old leaf extract (b) young leaf extract (c) young leaf (d)unsmeared young leaves.

8. In table 4, X^2 indicates the significance of increased ant activity owing to the interrelationship between the following two

variables.

(a) Young leaf extract and young leaves.
(b) young leaf extract and old leaves.
(c) old leaf extract and young leaves.
(d) old leaf extract and old leaves.

9. The following significant inference also emerges from the experiments.
   (a) Sucrose attracts the ants.
   (b) Some chemical factors in the leaves attract the ants.
   (c) Old leaves do not have the chemical factors that young leaves possess.
   (d) Unsmeared leaf edges also attract the ants to some extent.

10. Among the young leaves, the ants have a tendency to cut____
    (a) the virgin leaves.
    (b) the edges of the young leaves only.
    (c) the leaves that have been already cut.
    (d) the youngest leaf.

C5. (i) State what information of the book (author, publisher, year, page, place & title) and in what order are listed under "Reference or Bibliography"

____ (a?) ____ (b?) ____ (c?) ____ (d?) ____ (e?) ____ (f?)

(ii) Note the index to Tables, Charts, etc. given for the interpretation of the figures in the Tables and Charts. (If it is a curve, you should note the indications given along the 'X' axis and the 'Y' axis)

(iii) Form the Discussions for Tables 3 and 4

(iv) Form a Table for the information relating to the application of sucrose solution on old leaves.

Session D: *Integrated Grammar and Writing a Popular Leaflet*

1. (i) The following is a short technical news item published in a journal. As it conveys information of some practical value, the technical information has to be conveyed to the general public for adoption

in the form of a popular leaflet. The news item has been rewritten first as a 'Message', and then as a 'Leaflet'. Go through them and fill in the blanks suitably.

(ii) **News item:** (Information) "Lord Ganesa Knows what to eat. He likes coconut very much. He likes *Vilampazham (Syrigium cumin)* also.The coconut is laxative in action. *Navalpazham* and *Vilamhazham* are astringent.These are antibilious in action."

2. (i)A successful communication focuses on the 'personal value' which the information may have for a set of readers or communicatees. First the 'information' has to be converted into a 'message carrying' form.Therefore information of practical value to the reader has to be identified and it is to be presented as the 'topic' of the message. Further, the reader is the receiver of the message, and hence needs to be addressed directly.

(It has been done for you for illustration; fill in the blanks suitably)

(ii) Message

If you suffer from constipation take____1___to avert it. The coconut is ___2____ in action. If you have too __3___bile take *navalpazham* or *vilampazham*. Thus __4__Ganesa matches his food suitably. He __5___coconut to avert constipation, and *navalpazham* ___6___ *vilampazham* to control bile.

3. (i) The above 'Message' may not still be successful with the communicatees for the following reasons (a) The communicatees may not know how and in what form to take them, (b) they may not be able to perceive the 'value' of the message for want of psychological and other local associations, (c) they may not be able to remember the message at the time when they need it and (d) further they may not accept it for want of cultural and social associations (credibility). Hence necessary additional information need to be included in order to help the readers overcome these problems, and then the message restructured accordingly. This is how a 'popular leaflet' is formed for purposes of successful extension communication. (This format has been developed and tested by the author; a few research, theses have also been undertaken at the Masters, and Doctoral level). The structural units are indicated in the margin; read the

'communication' and fill in the blanks suitably.

(ii) **Communication: A popular leaflet**

Lead:
Development: Do you suffer from constipation or ___7____? If you suffer from constipation you ____8____take modakams (rice balls) stuffed with ___9____*shavings and* jaggery. If you suffer __10___bile you may take naval-
Content: pazham or ___11____.
Coconut has been found to be ___12___in action. Hence it helps to __13__constipation. Navalpazham and Vilampazham are astringent __14___ property. These are antibilious in action. __15___is how the big-bellied.
Reinforcement: *Pillaiyer*(Lord___ 16___)balances his food, the laxative coconut___17___ antibilious navalpazham and vilampazham and manages ___18____all the offerings of His devotees __19____ the Thanvantrti aushadalayas prescribe laxative_____20__ preparations orantibilious *naval* fruit preparations to ___
Closure: 21 ___ patients.
You can do as Pillaiyar ___22___and be free from the problems ______23_____ constipation or bile. Learn to balance _____24____ food similarly. Balanced food keeps the ___25___away.

E.Formal Letters and Speeches

1. Imagine that Mr. Thomas Midgley Jr. has been invited to address the student body of your college and that you are required to deliver the welcome address. Make a welcome speech making use of the following 'note' on Thomas Midgley Jr.

(A) Thomas Midgley Jr. is a scientist of extraordinary creative talents and inventive genius. Thomas Midgley at the age of 26 invented Tetraethyl lead, a powerful chemical fuel for combustion engines, and 'Feron', a safe refrigerant by combining perhaps the most toxic element known as Fluorine with one of the most combustible gases, Methane.

2. Imagine that you are required to give a speech on the need to

develop scientific rationale and temper. Formulate and deliver a short speech making use of the following letter written by Thomas Midgley Jr. to Professor Ray Olpin.

(B) Thomas Midgley contracted Polio at the age of 51 and as a result suffered complete paralysis of the lower part of his body. He wrote the following letter to Mr. Ray Olpin President, University of Utah in response to the letter of Professor Ray Olpin enquiring about his health. Ray Olpin was also a scientist (Both of them are only officially connected and each had a great respect for the other).

Dear Mr. Olpin,

Thank you for your letter of October 2 . I have been spending my spare moments in bed figuring out the statistical probabilities of a 51-year-old male catching poliomyletis, as I have, and this comes out to be substantially equal to the chances of drawing a certain individual card from a stack of playing cards as high as the Empire State Buildings. It was my tough luck to draw it but, on the other hand, I have figured out that it is 15,000 times likely for a male aged 51 to have a coronary thrombosis or 500 times more likely to have an incurable cancer or seven thousand five hundred and sixty-two times more likely to be bumped off in an automobile wreck. All of which can be taken to prove how lucky I really am. As you no doubt recognize, the above is a lot of damned silly pollyanna rot, I am unlucky in getting this vile distemper; but it has its real compensations in discovering what a splendid bunch of friends I have who have written me as you have. This helps a lot.

Best regards,

(Taken from "Scientific Creativity", Ed. Calvin W. Taylor and Frank Barrow, John Wiley and Sons, Inc. NY, pp 1-2)

3. Imagine that you are required to make a few observations in a seminar on "Water Management", Make your observations using the information stated in the following letter.

(C) The following letter is written by a reader in Tanzania to the Editor of the magazine, "Courier", appreciating an article "water and life", published in an earlier issue of the magazine. The article was on how to help the soil retain moisture and water for agricultural purpose. The purpose of the writer is to present his views on the article as applied to the conditions in Tanzania. (The editor and the letter-writer do not know each other).

Sir,
I read your special double issue, ''Water and Life''(July-August) with great interest, as it dealt with the sort of problem that affects much of Tanzania. During the greater part of the year most of the area is very dry, and in the rainy season torrential downpours wash all at once down to the rivers taking with them a large part of the top soil, and leaving behind sandy wastes.

Even in the dry season the rivers here retain lots of water beneath their sandy beds. I have long been considering how to make use of this water to irrigate the nearby land, and in the monsoon season how to use the same means of irrigation working the opposite way to retain the water as long as possible on the land and thereby help it to infiltrate the soil.

The main thing is to find a cheap way to start the project so as to get other people interested in doing the same thing. For that reason, I intended to start a pilot project by digging a well into the river bed and taking out the water by means of wind mills and canal system. Your issue has made me much more aware of possibilities but also of the dangers involved, as in the case of using salty water for irrigation, etc.

Yours truly,
F.J.H.VAN De Laak
Shinyanga, Tanzania

(From the UNESCO COURIER, Feb.65, p.33)

4. Read the following letter written by a sales manager of a company to a customer and list the information which is likely to clear the probable anxieties of the customer, and influence the would-be buyer.

(D)

8 John Street,
London W.C.-1.

4 July 1972.

Messrs H.Cole & Sons,
Coronation Street,
Manchester-2.

Dear Sirs,

In reply to your enquiry of 19th June, we are pleased to recommend our Junior 'Extinguisher', Model H 4 for use in your offices.

The model is supplied complete with all brackets and we do the installation free of charge. It has the following advantages:

(1) It is small and light.
(2) It is simple to operate.
(3) It can be recharged in a few minutes.

The extinguisher is of heavy brass construction and can be installed for less than five pounds. Inspection by the makers once a year can be arranged for an annual charge of ten pounds

We thoroughly recommend the model as being a suitable one for you and will gladly provide a demonstration at your office to suit your convenience.

Yours faithfuly,

(Sales Manager)

(from A.L. Garside, (1967) Modern Business Correspondence, ELBS-- p-239).

Appendix - I

Two written tests : one mid-term and another final (2 hours each)

1	Questions on the science values/themes of the texts (6 out of 10)	9
2	(a) One self-contained text (unseen) of about 200 words with questions on cohesion, coherence and interpretation	3
	(b) One involved statement--to be rewritten in the words of the learner	1
3	Six short self-contained texts (known theme) with long blanks (completion exercises)	6
4	A 'cloze text (modified version of a seen text) with about 25 blanks	5
5	A science discourse (unseen) for conversion into non-verbal form	2
6	Graphic information (unseen) in science for conversion into coherent written passage	2
7	Four science statements (m.c.) with blanks (multiple choice of words : technical/semi-technical)	2
	30 X 2 = 60	30

Appendix II
Foreign Phrases

Certain foreign phrases denote fixed meanings. When they are used in the passage or in footnotes, they are normally italicized; important phrases you may come across in scientific books are given below:-

circa: about, used before dates or other figures
et al: and others
et seq: the one following
exempli gratia: (e.g.) for example
infra: below
fauna and flora (singular): animal and vegetative life
quod vide (q.v.) which see
sic: thus
supra: above
verso: the other side
ignoratio elenchi: arguments that are irrelevant
argumentum ad hominem: argument on premises which may not be true
a fortiori: a stronger argument
a priori: arguments based on philosophy
a posteriori: arguments based on actual experience
pros and cons: reasons for and against
ab ovo/usque and mala: from the beginning to the end
ad infinitum: to infinity
ad valorem: according to the value
alma mater: nourishing mother--(alumni: nurslings)--your university.
apropos: to the purpose
bona fide: in good faith, real
ceteris paribus: other things being equal
de facto: actual opposite '*de jure*': rightful,
de novo: anew
desideratum: something desired but not existing
de tour: a round-about way
en masse: in a body
esprit de corps: zeal for the society
ex tempore: on the spur of the moment

fait accompli: an accomplished fact
galore: in abundance
medias res: in the middle of a subject
status quo: in the same state as before
ipso facto: by the very fact
laissez faire: let alone freely
per se: by itself or themselves
petitio principii: arguing in circles
prima facie: at first sight
quid pro quo: an equivalent
sine qua non: an indispensable condition
sub rosa: secretly
sui generis: unique
via: by the way of
vice versa: the order being changed

Appendix III

Model paper for Single final Examination - B.E./B.Sc(Ag.)

Time: Three hours Maximum: 75 marks

Answer ALL the questions.
All questions carry equal marks.

1. Copy down the following passage, filling in each blank with an appropriate word (cloze test):

William Harvey, an English physician made a very important discovery which upset many old ideas about the human body. He ___born in 1578 in Kent and very ____ in his life he decided to become ___physician. He went to the internationally famous___school at Padua in Italy and studied ___under Fabricius. After taking his doctor's degree___returned to England.

He married and settled _____ and began to practise. The king appointed__physican at St. Bartholomew's Hospital and he held ___post for over thirty years. The notes___his lectures there which are preserved in ___British Museum show that he had found___that the heart circulates blood throughout the ___. However, he waited for several years, making ___experiments with different kinds of animals, before ___announced his discovery to the world. His___setting out his new theory was attacked __all sides at first; but in course___time, medical men came to appreciate his___.

Even long before Harvey's time it was__that the heart consisted of four chambers____that there were two kinds of blood___, arteries and veins. But no satisfactory account__the working of the heart was available. ___ noticed that every time the heart beats, ___arteries expand and give a pulse. He ___that the heart pumps blood through the ___into the various arteries of the body.___was also able to guess that the __of blood was in a circle, starting __the heart and ultimately coming back to__. However, as microscopes had not been invented _____, it was not easy to explain how__blood from the arteries came into the___. Now we know that this is accomplished ___a system of capillaries which are present __the body.

2.Re-write as directed:

(a) A new grain called triticale is now available in a number of countries, and contains/contain/5% more protein than wheat.___(Choose the appropriate word)

(b) Welding practices (undergo) many changes in recent years. ___(Use the proper form of the verb in brackets.)

(c) The seat is known as a saddle.A jockey sits on it.___(Combine the sentences using preposition +relative).

(d) We got six breads. (Correct the sentence).

(e) Clouds are of four different kinds: cirrus, cirro-cumulus, stratus and nimbus. (Rewrite as a sentence making use of 'classify').

(f) A car has a higher petroleum consumption than a motor-cycle. ___(Use the positive degree of comparison).

(g) Gravity makes all objects fall to the earth. (Rewrite using "because of").

(h) Polished surfaces reflect heat well. An electric room -heater has a polished reflector.__(Join the statements using a suitable link word).

(i) He wanted to drive faster.He depressed the accelerator pedal. (Join the two sentences using 'in order to').

(J) We can measure atmospheric pressure using a barometer. (Rewrite beginning: A barometer is used____).

(k) A computer is used for performing complex calculations. (Rewrite beginning: The function of a computer is____,

(l) We paint metal surfaces. In this way we prevent corrosion. __ (Join the sentences using the appropriate forms of the verb specifying the method).

(m) The solution is weakened___Water is added. (Complete in one sentence using suitable 'method' expression)

(n) The trench is two metres deep.__(Rewrite beginning: The trench has___).

(o) Without heavy rains there will be no flood in the river. (Rewrite beginning: The river will not flood___).

3. Read the following passage carefully and answer the questions given below:

Antibodies, the most familiar and longest known of the body's defenders against infectious disease, are being drafted into extraordinary roles new to medicine and biological research. Antibodies are being rebuilt in may ways by scientists, who hope to use them for slicing and redesigning proteins, the body's most varied and important substances, for poisoning cancer cells and for performing other novel roles that nature never contrived. The new designs are expected to provide potent new tools for research and may *in time* give doctors new weapons and strategies against disease ranging from viral ailments to cancer.

In many different ways and for almost innumerable scientific purposes, research on antibodies is in progress in laboratories everywhere. Two *hallmarks* of antibodies are their ability to bind to specific targets and their incredible diversity. If we can *harness this vast array* to do chemical work , antibodies will take on an important new dimension in biology and chemistry. Many of the new uses would be in basic research, but some might have important practical value. An antibody capable of cutting a protein, for example, might be aimed at the protein coat of a virus. Such antibodies might be injected in a virus-infected patient to chew up the viruses and halt the infection. In principle this could be done much more efficiently than by using a vaccine.

Emerging strategies in the exploration now under way include the production of antibodies that are hybrids between mouse and human__of antibodies armed with potent cell poisons to send as guided missiles against cancer cells and of antibodies of radically new design that may prove more efficient or easier to produce. Newest and perhaps most revolutionary, however, is research to develop antibodies that will act as enzymes, the catalysts on which all biology depends.

(a) State whether the following statements are true or false, according to the passage: (4 marks)

- (i) For very long time antibodies were being used to attack proteins in the living body.
- (ii) A large number of widely different antibodies are available in the laboratory.
- (iii) Attempts are being made to utilise antibodies to do the work of enzymes.

(b) Answer the following questions in a sentence or two:

- (i) What does *in time* mean in paragraph 1?
- (ii) Explain what is meant by "harness this vast array" in para 2.
- (iii) Mention one specific property of antibodies mentioned in the passage.

(c) Complete the following sentences suitably: (6 marks)

- (i) Research on antibodies is going on in laboratories all over the world...
- (ii) A remarkable development in research on antibodies in recent times has been...
- (iii) Proteins are....

(d) Choose the correct answer from the alternatives: (2 marks)

- (i) The word 'hallmarks' in para 2 refers to:
- (1) Specific characteristics (2) activities (3) marks found on the surface.
- (ii) The new designs of antibodies that are being developed are expected to:
  - (1) synthesize enzymes in the laboratory.
  - (2) attack viruses in the body
  - (3) provide new tools for research work.

OR

Study the following table carefully and report in a short paragraph and interpret the information contained in it:

Registered graduates in employment exchanges at Poona.

S.No.	Professional persons	1981	1982	1983	Total
1.	Doctors	305	206	301	812
2.	Engineers	406	307	256	969
3.	B.Sc.(Ag.)	205	340	215	760
4.	Arts & Science graduates	450	375	485	1310

4. Organise the following in the form of a laboratory report:

You should know that ammonia gas can be prepared in the laboratory by heating ammonium chloride (NH_4 Cl) with dry slaked lime ($Ca[OH]_2$].This is how I prepared the gas. I started with 50 gms powdered NH_4 Cl and added to it 150 gms of powdered $Ca[OH]_2$. Then I transferred this mixture to a mortar in which I ground it well with a pestle. Do you know what I did next? I put this well ground mixture into a 250 cc flask which I then filled with small lumps of quicklime [CaO]. I placed the flask on a wire-gauge clamped to a stand so that when I wished I could place a flame under it. I connected the flask to a delivery tube (of course through a single-hole cork] and inserted the other end of the tube into a drying tower filled with lumps of quicklime. You should know that in turn I connected the drying tower to an inverted bottle or jar. When the whole apparatus was thus in position, I placed a Bunsen burner and lighted it under the flask. Soon ammonia flowed out through the drying tower and collected in the inverted bottle or jar, as it was lighter than air. You see, this is called downward displacement. I made sure that this jar was full of ammonia (NH_3) by holding a moist red litmus paper near the mouth of the jar and lo! it became dark blue !

OR

Read the following extract from a speech delivered by Dr. S. Radhakrishnan and draft a letter to the editor of a daily newspaper, stressing the need for a broad-based humanistic education for our people.

If we wish to follow up political revolution by a social and economic one, our universities must send out batches of scientists, technicians, engineers, agriculturists, etc. These are essential for changing the face of our country, the economic character of our society. But we should not believe that science and technology alone are enough. There are other countries, much advanced in the world, which have achieved marvellous progress in science and technology, but yet they are torn by strife and they are unable to bring about peace, safety and security of their own people. It only shows that other qualities are also necessary besides those developed by science and technology.

While we retain science and technology we must remember that these are not all. We must note the famous statement that merely by becoming literate without the development of compassion we become demoniac. So no university can regard itself as a true university unless it sends out young men and women who are not only learned but whose hearts are full of compassion for suffering humanity. Unless that is there, university education must be regarded as incomplete.

5. Read the following description of a pressure cooker and give numbered instructions on how to cook rice and potatoes using the cooker. List the precautions to be taken.

A pressure cooker consists of a vessel with a strong body and air-tight lid and an opening which can be closed by a detachable valve or weight. When water is poured into the vessel and heated, the whole of it gets filled with steam. If the vessel is closed at this stage and the heating continued, pressure builds up inside, cooking whatever is kept inside in a short time. The principle is that food gets cooked in shorter time under high pressure than under normal atmospheric pressure. The food itself has to be kept in a separate container, preferably with a lid of its own. There is a provision to know when the pressure builds up beyond a certain level. Then the weight or valve opens with a hissing noise and the excess pressure is released. A table of cooking times for different kinds of food is generally provided.

OR

Read the following passage carefully and (a) make notes from it and (b) summarise it stressing how we can get over unreasonable opinions and prejudices. (Reviewing and Interpreting).

A good way of ridding yourself of certain kinds of dogmatism is to become aware of opinions held in social circles different from your own. When I was young, I lived much outside my own country-- in France, Germany, Italy, and the United States. I found it very profitable in diminishing the intensity of insular prejudice. If you cannot travel, seek out people with whom you disagree and read a newspaper belonging to a party that is not yours. If the people and the newspaper seem mad, perverse, and wicked, remind yourself, that you seem so to them. In this opinion both parties may be right, but they cannot both be wrong. This reflection should generate a certain caution.

Becoming aware of foreign customs, however, does not always have a beneficial effect. In the seventeenth century, when the Manchus conquered China, it was the custom among the Chinese for the women to have small feet, and among the Manchus for the men to wear pigtails. Instead of each dropping their own foolish custom, they each adopted the foolish custom of the other, and the Chinese continued to wear pigtails until they shook off the dominion of the Manchus in the revolution of 1911.

For those who have enough psychological imagination, it is a good plan to imagine an argument with a person having a different bias. This has one advantage, and only one as compared with actual conversation with opponents; this one advantage is that the method is not subject to the same limitations of time and space. Mahatma Gandhi deplored railways and steamboats and machinery; he would have liked to undo the whole of the industrial revolution. You may never have an opportunity of actually meeting anyone who holds this opinion, because in Western countries most people take advantage of modern technique for granted. But if you want to make sure that you are right in agreeing with the prevailing opinion, you will find it a good plan to test the arguments that occur to you by considering what Gandhi might have said in refutation of them. I have sometimes been led actually to change my mind as a result of this kind of imaginary dialogue, and short of this, I have frequently found myself growing less dogmatic and cocksure through realising the possible reasonableness of a hypothetical opponent.

II One practical test--2 hours

1. Reading a short passage aloud meaningfully	2
2. Reading a long passage silently and answering a few comprehension questions within a given time	5
3. Teacher-student dialogue	4
4. Completing parts of a (heard/written) dialogue	4
5. Listing four words each falling under five schematic heads	5
6. Studying graphic representation and oral interpretation	5
7. Listening to a passage and answering given questions	5
	30
III Record work (class and homework)	10
TOTAL	100

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